Oſteographia Elephantina:

O R,

A full and exact Deſcription of all the Bones of an *Elephant*, which died near *Dundee*, *April* the 27*th*, 1706. with their ſeveral Dimenſions. Communicated in a Letter to Dr. *Hans Sloane*, R. S. Secr. By Mr *Patrick Blair*, Surgeon, *&c.*

SIR,

Preface.

THE *Elephant*, tho' an Animal ſo conſiderable for its Bigneſs and Strength, ſo remarkable for its extraordinary Endowments and ſtupendous Actions (if I may ſo call them,) that it has become the Subject of the moſt Curious Naturaliſts of all Ages, and been admir'd by all thoſe who beheld it; yet has its Body been hitherto very little ſubjected to Anatomical Enquiries. This induc'd Me (when upon *April* 27. 1706. the laſt *Elephant* that was in *Britain* died near this Place) to beſtow ſome Pains in viewing its Parts at the Opening: But the Time was ſo ſhort, and Inconveniencies I labour'd under ſo great, that I was doubtful, whether what I had obſerv'd might prove worth your Own or your honourable Society's while, until I had addreſs'd your ſelf, and you were pleaſed to honour me with a return dated *July* the 11th following: Wherein you ſignify'd, ‘ You were glad the *Elephant* had fall'n where Notice ‘ might be taken of its Parts by Diſſection, and that the Bones ‘ would be well worth Obſervation, for ſeveral Reaſons; but ‘ chiefly one, namely, that there have been large Bones, ſup- ‘ poſed to be thoſe of *Elephants*, found many Feet deep in ‘ the Ground, and that if there were a Sceleton to compare ‘ them by, that matter would be more certain: And there-

‘ fore (tho' I had told you in mine that I was able to make but ‘ few of them) you deſired me to let you have my Obſervations. The better to enable me to do which, you favour'd me with two Treatiſes on *Elephants*, which I ſuppoſe to be the only Two hitherto communicated to the *Royal Society*; one whereof gives an Anatomical Account of the *Elephant* accidentally burnt in *Dublin*, *Anno* 1681. written by Dr. *Moulins*; which, tho' it requires a further Enlargement, being very brief both in the Anatomy and Oſteology, and the Figures not very exact, yet ſeems to have been the only Book which undeceiv'd the Author of the other, *viz. Wilhelmi Erneſti Tentzelij Hiſtoriographi Ducalis Saxoniæ Epiſt. de Sceleto Elephantino, Tonnæ nuper effoſſo, ad Anton. Magliabechium magni Ducis Hetruriæ Bibliothecarium.* This is the Treatiſe which deſcribes the Bones mention'd by you, found in an Hill near *Erfurt* in *Germany*; wherein the Author earneſtly intreats, ‘ That ‘ tho' by diſtance of Place he cannot expect from his Friend ſuch ‘ a Figure of the *Elephant* at *Florence*, (as *Cyampinus* formerly ob- ‘ tain'd) yet, that he would, as exactly as poſſible, take the Di- ‘ menſions of all the Bones, eſpecially of the Head, Teeth and ‘ Tusks, their Number, Situation and Origin; and he deſires further to know, how old that Sceleton at *Florence* was, how high, and when it was diſſected.

Therefore, *Sir*, in Obedience to your repeated Requeſt, in the ſeveral Letters you were pleaſed to Honour me with, and finding the Author of the laſt nam'd Treatiſe, has favour'd the Repoſitory of your Society with ſeveral Specimen's of the Bones he deſcribes, ſome whereof perhaps being broke, may come not to be ſo well known; that I may ſatisfy you to whom I am ſo much bound, for the many ſpecial and ſignal Teſtimonies of your Favour, your honourable and learned Society, for whom I have ſo great a Veneration and Reſpect, and to whom I ſhall be extreamly glad, if by theſe means I may be capable to do any ſmall piece of Service, and the Learned *Tentzelius* in that he ſo earneſtly deſires, and wherein I do not yet underſtand his Friend has anſwer'd him: In a word, that I may ſatisfy the World in ſuch Things as were of Moment in this rare and curious Animal, I ſhall obſerve the following Particulars, *&c.*

The Method of Procedure;

1*ſt*, Shew, how the *Elephant* fell in our way.

2dly, Remove ſome miſtakes which have been entertain'd, concerning its Original Names in the Holy Scriptures.

3dly, Give a ſhort Hiſtorical Account from Authors of the ſeveral Natural Functions and Automatical Performances of this Animal, with the Method of taking and taming it.

4thly, I ſhall give ſuch a Superficial Anatomical Deſcription of its Parts, as the Inconveniences I labour'd under at the opening would permit.

5thly, I ſhall give an exact Deſcription of all its Bones, ſuch as is uſually given in Treatiſes of *Oſteologie*, with a particular Account of the Dimenſions of theſe in this Subject.

6thly, A true Account of their Weight and Number.

7thly, The Method I us'd in mounting the Sceleton.

To all theſe I have added the Figures of the ſtuff'd Skin, mounted Sceleton, ſeparated Bones in different Views, and other Parts of this Animal; all done from the Original, (and repreſented in ſeveral large Copper Plates) as it now ſtands in the Hall of Rarities in this Place; the Copy whereof the *Royal Society* has been already pleaſed to approve, as intimated in yours to me in *June* laſt.

How the Elephant *fell in our way.*

After this Animal had travell'd moſt part of *Europe*, ſhe came at laſt to this Kingdom; where, after ſome ſtay at *Edinburgh*, they conducted her to the *North*, and in their return came along the Sea-Coaſt; where being but few Places on the Road for making Advantage, by long and continued Marches they haſtned hither; and when they were come within a Mile of this Place, the poor Beaſt, much fatigu'd and wearied, fell down. They us d many Endeavours to get her on foot again, but they all prov'd ineffectual. At laſt they digg'd a deep Ditch, to whoſe Side ſhe might lean, till ſhe were ſufficiently reſted; but that proved her Ruin; for ſhortly afterwards there fell great Rains, which fill'd the Ditch with Water: So that after lying in the puddle a whole Day, ſhe died next Morning, being *Saturday April* the 27*th* 1706. When the Keepers ſaw that ſhe was Dead .they came to the Magiſtrates of this Burgh, and having made Oath they had done her no deſigned injury, they got an Atteſtation accordingly, and went off, having firſt given the Cadaver to an Ingenious Gentleman, Capt. *George Yeman*, ſince Provoſt of this Town; by whoſe Care the People were prevented from carrying it all away in pieces, as they did one of the fore Joints, and we ſtill continue Maſters of the Remains; for the Day ſhe died, he was pleaſed to go out himſelf, and take me along with him, in order to have the Skin flea'd off, which was his chief deſign, and the Body opened, which was mine. As I was very glad of the Opportunity, ſo I was concern'd becauſe of the diſadvantage I was at, which kept me from proſecuting what I deſign'd: For there went out a great Multitude, the Day was very hot, and being the laſt Day of the Week, the Subject could admit of no delay, eſpecially ſince it lay in the high Way and open Fields: So that I ſcarce had any convenience to pry into, or ſo much as to ſee any thing of moment, much leſs to enquire ſo nicely into the Structure of the Parts, as the Subject requir'd. 'Twas One of the Clock in the Afternoon before all were in readineſs to go out, and moſt of the time was ſpent by the Butchers in fleaing off the Skin. All I got done, was to take ſuch narrow Inſpection of the Muſcles of the *Proboſcis*, (or *Promuſcis*, as ſome call it, in *Engliſh* the Trunk) as I could. Afterwards I caus'd the *Abdomen* to be open'd, and then the *Thorax*, and that by the unweildy Hands of unruly Butchers, who at opening the firſt, wonld have wholly cut through the *Oſſa Innominata*, had I not hinder'd them; and at laſt, whether I would or not, did ſo flaſh the *Sternum*, and mangle ſeveral of the *Cartilages*, as to render them uſeleſs, cutting and tearing whereſoever they came. I had not much above an Hour to beſtow when Night came on, and that amidſt a Throng and Rabble in mighty hot Weather. During that time I view'd the Situation of the *Viſcera*, took the Figure and Dimenſions of the *Liver*, extracted the *Uterus* and *Bladder*, and caus'd the *Head* to be cut off, which (with ſome other Parts I deſign'd to have diſſected) were brought to Town. I had a mind to be more fully ſatisfy'd about the *Inteſtines*, *Spleen* and *Kidneys* on *Monday*; but when I went out again, the *Inteſtines* were all dry'd by the Heat; ſo that their Figure and Structure were quite ſpoil'd, and the Country People were ſo earneſt to have Parts of it, that they had ſtole away the whole fore Foot before that time; which, after much Pains and the earneſt Care of Provoſt *Yeman*, we recover'd about 6 Weeks afterwards: So that the time I deſign'd to have beſtow'd in Diſſecting the Parts I had reſerv'd, was taken up in excarnating, boyling, and taking care of the Bones; which, had not ſome Phyſitians and Surgeons gone out and aſſiſted me on the *Monday*, had been all carried off; and the heat of the Weather was ſuch that the other Parts would not keep. This, I hope, will be a ſufficient excuſe for the Lameneſs of the following Account.

The Behemoth *in* Job *is not the* Elephant.

Becauſe the Names given to the *Elephant* in Holy Scripture have been much miſtaken, tho' perhaps it may ſeem forreign to my Buſineſs, yet I hope 'twill not be unpleaſing, if from Authors I endeavour to clear them. *Junius* and *Tremellius*, *Franzius*, &c. who comment upon the 40*th Ch.* of *Job v.* 15. and downward, take the *Behemoth* for the *Elephant*; but others, ſuch as the Learned *Bochart*, *Par.* 2. *lib.* 4. *c.* 15. and from him Dr. *Patrick*, are of Opinion, 'tis not the *Elephant* which is meant there, but the *Hippopotamos*, or River Horſe; for *Buxtorf* and ſuch others as are acquainted with the Original, agree, that the Word *Behemoth* does not properly ſignify any thing more than a great Beaſt; and both in *Job* and *Eſdras*, 6 *Ch. v.* 49. (where the *Behemoth* is tranſlated *Enoch* in the *Engliſh* Bible) the *Behemoth* and *Leviathan* are nam'd together. *Eſdras* makes them the Work of the Fifth Day, wherein Fiſhe, other Sea Animals, and Sea Fowls were created; by which not the *Elephant*, but the *Hippopotamos* may be meant, which *Bochart* proves by the following Arguments. 1. As in *Job* 39. Land Animals, ſuch as Quadrupeds and Fowls, are ſpoken of; ſo in the 40 and 41. *Behemoth* and *Leviathan*, as belonging more properly to the Water, are treated of. 2. The Force of the *Behemoth* is ſaid to be in the Navel of his Belly, whereas 'tis the ſofteſt part of the *Elephant*; but in the *Hippopotamos* it is ſo thick and impenetrable, that it reſiſts both Spears and Darts, which he abundantly proves from Authors. 3. The *Behemoth* is ſaid to move his *Tail* like a *Cedar*; now the *Tail* of an *Elephant* is long like that of an *Ox*, and but ſmall in proportion to the Body; and to move like a *Cedar*, would import ſome ſtrong round ſubſtance, and rather ſeems to agree with what *Bellonius* affirms of the *Hippopotamos*, that *Caudam habet brevem, craſſam & rotundam*, tho' *Bochart* renders it *Retorquet, & non arrigit Caudam*, as *Junius* has it. 4. *Bochart* ſays, that the Word in the Original will not imply *Nervis Teſtium ipſius*, as *Junius* has it, but *Nervis Femorum &c.* Not the Sinews of his Stones, but the Nerves of his Thighs are intricate. 5. The *Elephant* ſeldom lies down, and never in the Covert of Reeds and Fens; for tho' it loves Water very well, yet it would be very hurtful to ſuch an unweildy Animal to lye down among ſuch moiſture as Reeds uſually grow in, or the being among the Willows of the Brook would import. 6. At the taking of an *Elephant* they never pretend to enſnare it by the *Proboſcis*; and when taken it is a moſt decile Creature, it being more compatible for the *Hippopotamos* to paſs through Snares: The uſual way of catching it being in Nets made of Iron, which they make on purpoſe at *Damaſcus*, as *Albertus* and *Vincentius* affirm; and when taken, is no ways managable, but they are forc'd to kill it with Iron Mallets, becauſe of the thickneſs of the Skin. 7. 'Tho the Bones of the *Elephant* be proportionably big enough, yet they are far from ſuch Strength as to make a Parallel between them and Braſs or Iron; for they ſhall be ſhewn hereafter to be more porous than the Bones of moſt *Quadrupeds:* And although their Tusks and Teeth may be ſaid to exceed all other Bones in Solidity and Whiteneſs, yet I am aſſur'd, that the Teeth of the *Hippopotamos* doth even exceed them; for the Ivory of an *Elephant* after ſome time becomes Yellow, and the Teeth of the *Hippopotamos* when apply'd to any uſe, continue always of a pure white Colour.

The different Names of the Elephant.

An *Elephant* in the *Syriac* and *Arabic* is *Senhab*, but in the *Chaldaic* and later *Hebrew* 'tis taken for *Elephant's* Teeth, becauſe *Sen* in the *Hebrew* ſignifies a Tooth. Hence it is, that 1 *Kings*, *Ch.* 10. *V.* 22. 'tis rendred by *Junius*, &c. *Ebora*, *Semias & Pavones*, *Ivory*, *Apes* and *Peacocks*, in our Tranſlation; where *Senhab* is rendred by the later *Hebrews*, *Dentes Elephantorum*, but by the *Syrians* and the *Arabians*, *Elephantos*; and therefore *Bochart* thinks it ſhould rather have been *Elephantos*, *Simias & Pavones:* Firſt, becauſe of their better Coherence; and ſecondly, becauſe *Ivory* would not have been *Senhabim* in the Plural Number, but *Senhab*, *Dens Elephantis*; for *Ivory* is denoted elſewhere in Scripture by the Word *Sen*, as *V.* 18. of that ſame Chapter, where 'tis ſaid, *Solomon* built a great Throne of *Ivory*. *Sendephil* alſo in the *Chaldaic* Phraſe is taken for *Ivoty*; for *Phil* ſignifies an *Elephant* both in the *Syriac*, *Chaldaic* and *Arabic*. An *Elephant* in the Ancient *Hebrew* was call'd *Alikhaban*, and by Contraction *Alkaban*, that it may be diſtinguiſh'd from *Ikhaban*, which ſignifies a Buffle or Bugle, becauſe both are of that Colour: So *Bochart* conjectures, that *Sen* being prepon'd to *Kahab*, may by Contraction be call'd *Senhab*, which by a *Synecdoche* may mean the whole

Elephant. In *Greek* it is call'd, Ἐλέφας, and ſometimes Βοαρῆ, which is rendred *Bos Martius*, whereby they mean the *Elephant*. In *Latin* 'tis call'd *Barrus*, from the Voice; or ſome think that *Barrus* is the proper Name, as in *Horace* —— *Nigris digniſſima Barris*; and that *Barrire*, to Bray as an *Elephant*, comes from it. Thus we have from *Bellonius*, *Elephantes barrire dicimus*, *ſicut Oves decimus ballare*. Amongſt the *Indians* they are call'd *Praſij* and *Taxillæ*. Thus *Elianus* ſays, *Maximi Elephantorum qui illic ſunt Praſij dicti*, *ſecundi vero ab ijs exiſtimantur Taxillæ*. In the *Punic* and *Mooriſh* Language it is call'd *Cæſar*; hence it is, as *Servius* ſays, *Cæſar*, *vel quod cæſo Matris Ventre natus eſt*, *vel quod Avus ejus in Africa manu propriâ occidit Elephantem*, *qui Cæſar Pænorum Linguâ*. It is alſo call'd in *Latin*, *Bos*, *Lucas*, and *Elephantas*, from the *Greek*.

Hor. Epod. 12.

Hiſt. Lib. 130. 12.

The *Elephant* is ſaid to live to a great Age: Some aſſerting, they live to One Hundred and Twenty Years; Others, to 200 Years; ſome to 300; and there are who affirm, that they can live till they be 500 Years old, and that they are very ſtrong and robuſt at the 200 Year. *Tentzelius* tells us, that when a certain *German*, who had ſometimes been in the *Indies*, ſaw theſe Bones he treats of, concluded from certain Marks the *Indians* have, that that *Elephant* could not have been under 200 Years old. Mr. *Tavernier* ſays, he could never learn exactly how long the *Elephants* liv'd; but that their Keepers have told him, they knew ſuch an *Elephant* to have been in their Great Grand father, Grand-father, and Father's Cuſtody, which he modeſtly computes not to have been under 120 or 130 Years. And 'tis memorable, which *Juba* King of *Lybia* told, as it is related by *Philoſtratus*, that the Knights of *Lybia* at a certain time fought upon *Elephants*, ſome whereof had a Tower engraven upon their Teeth, others nothing; and when by the Night they were ſeparated, ſuch as had the Tower were beat, and fled to the high Hill *Atlas*: And that the ſame *Juba* after 400 Years took one of them, which had this Enſign ſo lively engraven, as if it had been but lately done. I am not to anſwer for the truth of this, but they ſeem generally to live to a great Age; for the Keeper told, that the *Elephant* which fell in our way was 26 or 28 Years old; notwithſtanding which ſhe ſeems to have been Young, according to the Term of Life, for the *Epiphyſes* ſeparated from the Bones by Boyling as eaſily, as thoſe of an Human Subject would have done at the Age of 10 or 12. However, 'tis an Animal Subject to many Diſtempers; ſo

To what Age they live.

Tavernier's *Travels in* India, *p.* 96.

that tho' they may live to ſome of the fore mentioned Ages, yet moſtly them periſh before they come to ſuch length.

Uſual bigneſs of the Elephant.

'Tis certainly an Animal of conſiderable Bigneſs; but whether ever ſo large as to contain 32 ſtrong Men upon its Back, as is related, *Maccab* Ch. 6. *v.* 37. beſide the *Indian* that govern'd it, is much to be doubted; and 'tis more probable that this is an Error in the Impreſſion, as is well enough obſerv'd by *Grentemeſnil*, who inſtead of Ἄνδρες δυνάμεως δύο ϗ τριάκοντα οἱ πολεμοῦντες ἐπ' αὐτοῖς, *Viri fortes duo & triginta, pugnantes in ijs*, believes it ſhould be rather, Ἄνδρες δυνάμεως δύο ἢ τρεῖς ἀκοντίοις πολεμοῦντες ἐπ' αὐτοῖς, *Viri fortes duo aut tres pugnantes ſuper ipſos Jaculis.* Indeed *Philoſtratus* ſpeaks of 10 or 15 *Indians* fighting in Caſtles with Darts on *Elephants* Backs: And *Paulus Vineta* ſays, that in the Ginger Iſlands they have Wooden Caſtles upon *Elephant's* Backs, which can contain 15 or 20 Men. But the Learned *Bochart* very pleaſantly ſays of theſe Authors, that *de magnis majora loquuntur*; becauſe this is a big Beaſt, they delight to ſpeak at random of it. I rather believe what *Heliodorus* ſays, that the Towers upon the *Elephants* Backs could contain 6 fighting Men, who from each ſide drew Darts, the hinder part remaining void; or *Cadamuſtus*, that they put Towers upon the Back, which can hold 3 or 4 Men that fight upon them; and *Ælianus*, that they carry 3 Warriours fighting from either ſide, and the 4th which governs them. Which 3 laſt Accounts ſeem very well to quadrate with the uſual height aſcrib'd to them: About which ſome Authors talking more largely, tell us of 18 or 16 foot high; but the moſt received Account is, that they are from 13 to 8 foot: So that as our *Elephant* was none of the biggeſt, ſhe did not ſeem to have been any of the leaſt ſize. I ſhall give you her particular Dimenſions hereafter.

Bochart *de Animal. S.S. Script. C.* 27. *Col.* 269.

Philoſt. lib. 2. *c.* 1.

Lib. 3. *C.* 41.

Heliod. *lib.* 9.

Cap. 62.

Their manner of Procreation.

The next to be conſider'd, is their manner of Procreation, about which Authors differ very much. All agree that it is an Animal of extraordinary Modeſty, and therefore never copulates in view of any; which becauſe 'tis a big unweildy Body, hath put Authors to a loſs as to the Poſture. Some aſſerting, that it is Retrocoient and Retromingent; among whom is Dr. *Moulins*, from an Obſervation he has made of the Situation and Structure of the *Penis*. Others obſerving the diſtance betwixt the *Anus* and *Vagina*, and that the Duggs are ſituated between the fore Limbs, are of Opinion, that the Female is in a Supine, and the Male in a Prone Poſture: Among whom is *Tavernier*, who tells us, 'That the Female gathers a great deal of Herbs and Weeds, and makes

‘ her Bed ſome 4 or 5 foot high from the Ground, where ſhe ‘ throws herſelf, and lies on her Back in expectation of the Male, ‘ whom ſhe invites by a peculiar Cry; therefore perhaps it may be, that the Duggs are placed ſo forward, to avoid the Preſſure. A third Opinion is, that at the *Coitus*, the Female deſcends into a Ditch, and that the Congreſs with the Male is no otherwiſe with them than with other Quadrupeds. As to the firſt, I can ſcarce believe it probable, becauſe there can be no ſuch thing as a Retrocoïent Animal; for that would quite invert the order of Nature, and give a far different motion to the Muſcles of the Thighs, than they can be ſuppoſed to have from their Situation; and I am credibly inform'd by thoſe, who have been at the Pains to obſerve them, that Hares, Cats, Rabbits, *&c.* who are ſaid to be Retrocoient, do Copulate no other way than Dogs and other Quadrupeds; and that Retrograde Poſture we ſee Dogs in at that time, is nothing but an endeavour to get rid, when (by means of the ſwelling of the *Glans*,) the Male and Female are too cloſe together, and far from a deſign of penetrating further into the *Vagina*. As to the ſecond Opinion, were it not for Monſieur *Tavernier*'s Aſſertion, I ſhould think it too unweildy an Animal, and of too ſmall an Inclination to lye down, to acquire ſuch a Poſture. The third Opinion is, that the Natural Sagacity of the Animal diſpoſes the Female to go into the Ditch, and both fore and hind Legs ſeem to be ſo articulated as to favour this: For when the Female would bring the Body low, ſhe has no more to do, but to ſtretch forward her fore Feet, and then the Articulation of the *Humerus* with the *Cubitus* will bend backward; and to bring back her hind Feet, ſo as to bend the Knees forward, by which ſhe can bring the fore part of the Body ſo low, as to make the *Nates* Protuberant, and bend the hind Legs, whereby to put the *Vagina* in a convenient Poſture for Reception of the *Penis*, according to that of *Ariſtotle*, *Subſiſtit Fæmina*, *Clunibuſque Submiſſis*, *inſiſtit pedibus ac innititur*; and elſewhere, *Flectit certe ſuos poſteriores Poplites modo Hominis.* Which of the two laſt Opinions may be true, I know not, but you have the Aſſertion of two famous Authors for both.

How long they go with Young.

What Time they begin to Copulate is uncertain; tho' from their uſual term of Life, Authors ſeem probably to conjecture, that ſome begin at the fifth Year, others much later, yea, not till the Twentieth. The time alſo of their going with Young is in debate; for their innate Modeſty keeps ſuch as would

obſerve them from any certainty. The only way to know, is
(where they abound) to obſerve their ſeparating themſelves from
the Flock; for it is a gregarious Animal, as Naturaliſts term
them; and 'tis obſerv'd, when they begin to be proud, (ſo to
ſpeak,) that the Male and Female go apart, (and if any obſerve
them at that time, the Male runs upon them with Fury and Madneſs)
and do not return till the Female is impregnate. Some
fondly imagine from their extraordinary Bigneſs, that they go
with Young 9 Years, others 6, and others 2; but to me the moſt
probable is, that of 15 or 16 Months; and if we obſerve the
ordinary courſe of Geſtation in other viviparous Animals, it
is according to the Bigneſs and Term of Life, that the Female
uſually goes with Young. Thus you have Bitches and Cats going
but 9 Weeks, while Mares and Cows go 9 Months: So that,
Cæteris paribus, this our Animal may be ſuppos'd to go 15 or 16
Months; and Mr *Knox* in his Relation of the Iſland of *Ceylan*,
tells us, they go not with Young above one Year: Some ſay, they
Acta Lipſ. Suppl. Tom. §. 1. pag. 39. bring forth after every third Year; and others, never but once
in their Life. The firſt Opinion may be probable, but the ſecond
is ſcarce to be believed; for it would be ſtill more wonderful,
and next to an Impoſſibility, to ſee ſuch Numbers of *Elephants* in
Armies and Countries, as we read of. Mr. *Tavernier* tells us,
‘ He has been inform'd, that the Great *Mogul* keeps Three or
‘ Four Thouſand *Elephants*; but that the chief Maſter aſſur'd him,
‘ he had not above 500 ſaid to be of his Houſe, and deſign'd
‘ for carrying Women, Tents and Luggage, and about 80 or 90
‘ for War; which is a great Number of tam'd ones. And from
thence we may ſuppoſe, that there muſt be a far greater Number
of Wild ones in his Dominions, beſides what are in the
Kingdom of *Pegu* (where, as *Schotto* relates from *Garzias ab Orta*,
Mirab. Animal. Ter. lib. 8. at one Hunting there were 4000 taken at once) *Siam*, *Cochin*
and *Boutan* near Great *Tartary*, beſides theſe of the Iſland of
Sumatra and *Ceylan*; where *Tavernier* reports for a certain truth,
‘ That when any *King* or *Roja* has one of them, if they bring
Tavernier's *Travels in* India 195. ‘ the Breed of any other Place, ſo ſoon as the other *Elephants* behold
‘ the *Ceylan Elephants*, by an Inſtinct of Nature they do them
‘ Reverence, by laying their Trunks upon the Ground, and raiſing
‘ them up again. 'Tis ſaid the Male never copulates with
the Female after once ſhe is impregnate; and ſome will have
us to believe, that every Male keeps to his own Female. 'Tis
alſo ſaid to be a very temperate Creature, and ſeldom in Luſt.

Tavernier

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Tavernier tells us, that the Male never meddles with the Female when once he is taken, but is ſometimes ſeized with a luſtful Rage, whereof he gives this memorable Inſtance: ‘One Day when *Chajehan* King of *India* was a Hunting upon one of his *Elephants*, with one of his Sons who ſat by him, the *Elephant* became ſo furious by reaſon of his Luſt, that the Governor, who was by no means able to maſter him, declar'd to the King, that to allay his Fury, who would elſe doubtleſs bruiſe him to pieces among the Trees, there was no way but for One of the Three to forfeit his Life, and that he would willingly Sacrifice his for the ſafety of the King, and the Prince his Son; only he deſir'd his Majeſty would take care of his Children; which ſaid, he threw himſelf among the *Elephant's* Feet, who had no ſooner taken him in his Trunk, and ſqueez'd him to pieces with his Feet, but he grew as quiet and peaceable as before. Whether this Rage proceeds from Luſt, or it be a kind of Madneſs, which Mr *Knox* in the forecited Place tells us, they are ſeiz'd with at certain Seaſons, which is known by the Efflux of a Liquor from their Jaws like Oyl, and which afterwards goes off of its own accord, I ſhall not determine; but 'tis probable to have been the latter, and that by this ſign the Keeper did know the Diſeaſe. The ſaid Mr *Knox* adds, that the Females ſuckle indifferently the young ones of others as well as their own. 'Tis reported of them, that they only bring forth one at once, tho' if it were not for the unanimous Aſſertion of all Authors, I would be ready to believe they bring forth more, for Reaſons hereafter to be given; and that that one is about the bigneſs of an Hog, or as ſome ſay of an big Calf; which ſeems to quadrate with the Account of *Tavernier*, who tells us, that when the Merchants bring the *Elephants* to ſell, the Children do uſually leap upon their Backs, which could not be done were they higher. They are ſaid to ſuck for 6 Years, or according to ſome 8; tho I rather adhere to the Opinion of thoſe, who tell us, they quit their Dame at 6 Months, if it be true, that when they are brought forth, they both ſee and walk; for if ſo, they may as ſoon come to purchaſe their Food as Colts and Calves.

Its Natural Food.

The Natural Food of the *Elephant* is Graſs, and when that's wanting, they dig up Roots with their Tusks. This perhaps may be one of the Reaſons, why the *Behemoth* is taken for the *Elephant*, becauſe 'tis ſaid to eat Hay like an Ox; but that, as *Bochart* tells us, is common to the *Hippopotamos* alſo. They are ſaid to have a great delight in Cucumbers and Melons, and a particular Inſtinct in avoiding whatever Herbs may be hurtful to them. Tis alſo obſervable, they will not go near any Graſs that has been trampled on by Men, for fear of Snares. When they are tam'd, they eat Hay, Oats, Barley, or ſuch other Food as Oxen and Horſes. It drinks a great quantity of Water, which it ſucks up by the Trunk, and whenever that's full, it emptieth it in the Mouth. It naturally affects muddy Water rather than clear: When Tame, it drinks clear Water well enough. When they are to go to Battel, they give them Spirituous Liquors, ſuch as Wine, *&c.* in order to make them drunk and furious, as appears from the Hiſtory in the third Book of *Maccabees*, Chap. 6.

Acuteneſs of Smelling.

It has a very acute ſenſe of Smelling, by which it readily finds out its Food. 'Twas pleaſant, that when they came to ſee the Creature, with Apples in their Pockets, it pull'd them out to the aſtoniſhment of thoſe who had them. I'm inform'd one of the greateſt Miſchiefs it got, was, when in the North of the Kingdom, being in an Houſe, next to which was another with a great deal of Corn in it, and the poor Beaſt being hungry, and ſmelling the Corn, beat up and preſt into a very narrow Door, where its Sides were very much cruſh'd, and they had much ado to get it out: And when at *Perth*, it beat up a Stable next to the Houſe where it was, and moſt induſtriouſly ſingl'd out the clean Straw from among the Dung that lay among the Horſes Feet.

Several Natural Functions of the Elephant.

I come next to give you ſome Inſtances of its Natural Endowments, the manner of taking it, and its wonderful Docility when Tame. *Pliny* ſays, that *maximum eſt Animal, proximumq; humanis Senſibus*; as appears in their Care of their Young, for they rather chuſe to loſe their own Life, than that they ſhould loſe theirs. They always go in Flocks, and the greateſt go foremoſt, and when they are to paſs a River, they lift the young ones acroſs upon their two Tusks, and twiſt the *Proboſcis* round about their middle; and make ſuch as are bigger go before them, the greateſt coming laſt; for did the greateſt paſs firſt, the River might chance to be ſo deep, that neither the leſſer ones could paſs, nor the bigger ſo readily aſſiſt them. When they paſs by any of their Dead, they cover the *Cadaver* with Branches of Trees, Graſs, or what elſe they can get. When any is wounded, the reſt take care of him, bring him Meat, relieve him from Danger, and run together to ſave him from the Hunter. When a Snare is laid for them, they ſoon perceive it; if it be a Ditch, he that's neareſt halts, (as it were by an Inſtinct) which when the reſt perceive, they immediately return with Fury upon the Hunter. *Tavernier* tells us, ‘That being once deceiv'd, and having eſcap'd the Snare, they are very diſtruſtful ever after; and when they get to the Wood again, they break off a great Bough from one of the Trees with their Trunk, with which they examine every Step they go, before they ſet down their Feet, to try if there be any hole in their way. When they go in Troops, if one of them perceives an Herb on which any Man has trampl'd, he pulls it up, and delivers it to the next, who ſmells it and gives it to a third, and ſo on till it come to the laſt, who makes a great Noiſe, upon which all go to flight, and retire to Hills, Mountains, Shady, and other leſs frequented Places, where when there is no more Graſs, ſome dig up Roots, others go and pull tender Buds, Herbs and Leaves of Trees; and the firſt that finds any thing, returns and convenes the reſt of the Flock, that he may communicate to them what he has purchaſed. When they are in a Battel, ſuch as are wearied or wounded, return to the Multitude, and ſuch as have been leſs expos'd, advance of their own accord. When they are to paſs over a Ditch, one or more go down (according to the breadth of it) and ſtand acroſs it, where making as it were the Column of a Bridge, all the reſt ſtepping upon their Backs, paſs over. When all have paſt, they bring him or them out after this manner: At the ſide of the Ditch one of them ſtands, and ſtretches out his Foot, which he that is in the Ditch takes hold of, by twiſting his *Proboſcis* round it; then the reſt make haſte and provide Branches of Trees, which they throw in, that he may the more eaſily ſtep up upon them.

Loco citato.

Their Love, Fidelity and Gratitude.

Their Love, Fidelity and Gratitude is wonderful: *Ælianus* tells us, when *Porus* King of *India* was ſubdu'd by *Alexander* the Great, he was wounded with ſeveral Darts, as was the *Elephant* he rode upon, who was careful to pull them out of his Maſter's Body with his *Proboſcis*; and when he perceived his Maſter faintiſh by the loſs of Blood, he gradually lean'd himſelf down, till he fell flat upon the Ground, that his Maſter might receive no damage by lighting off. There is alſo a Story related by *Athenæus*, of the Gratitude of an *Elephant* toward a Woman, who had done him ſome piece of Service: She laid her Child by him, when it was only Thirty Days Old, but afterward the Woman being Dead, he fell ſo in Love with the Child, that he could not endure it to be abſent from him, being moſt uneaſy when he did not ſee it; there-

Lib. 13.

therefore when at any time the Nurſe had ſatisfy'd the Child, ſhe laid it in a Cradle between his Feet; which if ſhe had not done, he would not eat any; but when ſhe did it, he would eat pleaſantly by the Child the whole Day. When the Child ſlept, he chas'd away the Flees with the *Proboſcis*; and when it cry'd, he would toſs or rock the Cradle, and thereby ſet the Child aſleep again. Several Inſtances of this Nature might be given from Authors, but theſe may ſuffice.

Wrath and Revenge.

Annal. Par. I.

But as their Love and Gratitude is great, ſo likewiſe are they ſubject to Wrath and Revenge. *Michael Glycas* tells, that when an *Elephant* at a time was brought into a Theater, he ſaw as he came along a Keeper of Wild Beaſts ſitting in the Market Place, whom in Paſſion he ſuddenly kill'd; and that the occaſion of this Revenge was, becauſe the ſaid Keeper about Ten Years before had ſtricken him with a Sword in that ſame Place. And *Acoſta* writes, that a Soldier in the Town of *Cochina* had thrown the Kernel of a Nut at an *Elephant*, which the *Elephant* took up, and carefully hid. Some Days after, the *Elephant* ſeeing the Soldier paſſing by, threw it into his Face, made a great Noiſe, and went away leaping and dancing. In that ſame Town another Soldier meeting an *Elephant* with his Keeper, would not give way to them, whereupon the Keeper complain'd to the *Elephant* of the Affront, who ſome Days after ſtanding on the River *Mangata*, which runs through the Town, and ſeeing the Soldier ſtanding idle, run haſtily toward him, lifted him up on the *Proboſcis*, and plung'd him ſeveral times in the River; after which he drew him out (having thus aveng'd himſelf) and left him where he found him.

The Method of taking them.

The manner of Taking them is; firſt, they dig deep Ditches, and cover them with Branches of Trees, *&c.* which, tho' the *Elephants* may ſometimes perceive, as is ſaid, yet they are frequently enſnar'd therein: When any fall in, the reſt are ready to throw in Branches of Trees, and ſuch other Materials as they can get, to ſee, if by any means, they can rid their Companion. Another Method us'd by the King of *Pegu* is, he builds Priſons for them of Wooden Pillars, at ſuch a diſtance as to ſuffer a Man to paſs, but not an *Elephant*; then he cauſes to be let go into the Woods ſome tame Females, whoſe *Pudenda* are anointed with a certain Oyl, for enticing the Male; and taking care that they do not copulate, they drive all together toward the Priſon, whence they convey the Females into Stables, which can contain no more but one at once; and the Males hot in purſuit are caught among the Pillars, and immediately ſome By-ſtanders lay acroſs Pales of Wood to hinder their Return. When they perceive the Cheat, they turn all in a Rage and Fury, and fall a groaning even to the ſhedding of Tears, and run up and down till they be all in a Sweat. When the Hunters deſign to put them in Stables, they let them ſee the Females again, whom they lead foremoſt, and the Males follow them to the intended place, which is ſo little, that it admits no more but one at once: Then they remove the Female, and tye the Male by the Neck to the Stall, till being wearied both by Hunger and Grief, they become more Tame, which is uſually after 8 Days faſting, and then the Keeper learns and manages them as he pleaſes. A third Method of taking them us'd by the ſaid King is this: He gathers a vaſt number of Men, by which he ſurrounds the whole Foreſt where the *Elephants* haunt, and having enclos'd them within a norrow bounds, he picks and chuſes ſuch as he has a mind for, and lets the reſt go. *Garzias ab Orta* ſays, that at one of theſe Huntings there were taken 4000, but that the King caus'd them all to be let go, except 200, leſt his Country ſhould be depriv'd of them. 'Tis memorable what *Edward Lopez* ſays he ſaw, that when a young *Elephant* was catch'd in one of theſe Snares, the old one run with violence (notwithſtanding of the By-ſtanders) to get it out; whereof being diſappointed, ſhe threw in Earth, Trees and Stones in ſuch abundance, that it fill'd the Ditch, and rather chus'd to deſtroy its own Brood, than let it fall into the Hands of the Enemy.

The manner of Taming them.

But if what Authors have told us of their manner of Taming be true, 'tis a wonderful Token of their Natural Sagacity. After they are taken, they hedge each of them in with great Rafters, till they be encloſed in ſo narrow bounds, that they can ſcarce have place to ſtand: Then they tye their Feet and Tusks ſo together, that they cannot move; their Keepers mount them, being girt about with two Ropes, and ſtriking with their Heels and Clubs, threaten to beat them, and to ſtarve them till they ſhould Die; but if they will be quiet and peaceable, they would be kind to them, anoint them with Oyl, and give them Meat and Drink in abundance. Then they take one of theſe wild ones, and put it in betwixt two Tame ones, and ſo confine it on both ſides till it be Tame enough. *Tavernier* tells, that he ſaw once two Wild *Elephants*, which had been lately taken, each of which had a Tame one plac'd on each ſide. Round about the Wild *Elephants* ſtood 6 Men, every one having an half Pike in his Hand, and a lighted Torch faſtned at the end of the Pike, and talking to the Beaſts gave them Meat, and cry'd out in their Language, *Take it, Eat it.* The Food which they gave them was a little Bottle of Hay, ſome pieces of brown Sugar, and Rice boil'd in Water, with ſome few Corns of Pepper. If the Wild *Elephants* refus'd to do as they were bidden, the Men made Signs to the Tame *Elephants* to beat them, which they did, banging the refractory one with their Trunks on the Head and Forehead; and if he offer to make any reſiſtance, the others thwart him on the other ſide; ſo that the poor Beaſt not knowing what to do, was conſtrain'd to learn Obedience. 'Tis ſaid theſe Methods ſoon take with the younger ſort, but for the old ones they put them into big Houſes, and treat them very harſhly, by wounding them with Darts, and ſtarving them till they be half Dead; and then by gentle Methods and fair Promiſes they tame them. *Ælianus* ſays, when all other Methods prove ineffectual with an old one, they have a certain kind of Muſical Inſtrument, wherein they play their own Natural Tune, to which they become ſo attentive, that they are ſoon taken with the ſweetneſs of the Melody; and laying aſide their Wildneſs, begin to look to the Meat that's offer'd them, and tho' they ſhould take off the Fetters, forget their ancient rudeneſs, and fall to their Meat with Greedineſs and Appetite. 'Tis indeed very ſurprizing to think, they ſhould underſtand either Flattery, Threatning or Muſick, when Tame, and if when Wild they do it, 'tis much more ſo. However, that it is a moſt docile Creature the Accounts of all agree, and Authors tell you wonderful Stories of them, ſuch as their Dancing to a Pipe, and keeping Time, Leaping, Skipping, Gathering and Strowing Flowers, exerciſing Fuzee and Pike, like a Soldier, and caſting of Colours, playing a great many antick Tricks in Theaters, and even Writing too, and underſtanding Human Speech. When it is in Sorrow, it hangs the *Proboſcis* low to the Ground, and 'tis by the ſame it makes its Gladneſs appear. It is an Animal very deſirous of vain Glory, and very Proud, when finely dreſt and richly adorn'd.

A brief Deſcription of the External Shape of the Elephant.

But leaving this, I come to the more particular Conſideration of the Creature I am now treating of. I ſhall firſt take notice of its External Shape and Dimenſions, and then of its Internal Parts, with their Structure. That it is *Animal Vaſtiſſimum*, I ſhall readily acknowledge with *Franzius*; but that it is deform'd, ſince thoſe due proportions laid down by the Author of Nature are as well obſerv'd in this as in any other Animal, I can hardly grant; for nothing can be deform'd but what ſwerves from a general Rule. It has a big ſhort Head, ſhort Neck, long Noſe, or *Proboſcis*, hanging almoſt to the Ground; a Back ſomewhat protuberant, a ſhort and round Body, a long Tail, four great round Legs, like ſo many Columns ſupporting ſuch a vaſt weight; and ſhort Feet, thoſe before being broader and rounder, and thoſe behind more long and narrow, each Shod with 4 Hoofes; a little narrow Mouth, with 2 long Tusks proceeding from the Upper Jaw, one on each ſide of the *Proboſcis*; 4 ſtrong Grinders in each Jaw; ſmall, yet piercing Eyes; and large flat Ears.

The particular Dimenſions of the ſtuff'd Skin.

The Dimenſions are as follow: At the fore Leg ſhe was 8 ½ foot high (A. A.) and 9 at the hind (B. B.) in length 10 foot (C C.) and a Tail 4 Foot 3 Inches long (C. D.) round the Belly 14 Foot (E. E.) from the top of the Head to the end of the *Prhboſcis* 8 Foot (F. F.) whereof the *Proboſcis* makes up 4 ½ foot (F. G.) from the Forehead equal with the Eye to the lower Jaw, meaſuring backward, 27 Inches (H. H.) from the top of the Head to the lower Jaw, meaſuring downward, 4 ½ foot (F. I.) The Ear was almoſt ſquare in this Subject, and ſmall in reſpect of thoſe in other Animals. Whether or not this difference might have been in regard of the Sex, I know not. 'Twas in lengh 19 Inches (K K) and in breadth 17 (L L.) The Eye (U) was not ſo ſmall as Dr. *Moulins* would have it; who ſays, they were no bigger in the Subject he treats of than thoſe of a Sheep; whereas in this they are larger than thoſe of an Ox. The diſtance betwixt them, meaſuring acroſs, was 26 Inches; between the *Anus* and *Vagina* 2 ½ foot; between the Dugs 1 foot. The fore Foot, meaſuring round the extremities of the 4 Hoofs, 3 foot 10 ½ Inches (N. N.) whereof the external Hoof running obliquely forward was 5 Inches; the ſecond on the outſide, ſquare before, was 5 Inches, and 6 in breadth, *i. e.* up toward the Skin; as was the third, ſquare alſo before, and 4 ½ half, (*c*) The Internal was more pointed than the External, and of the ſame length; the hind part of the Foot was cover'd with a tough thick Skin: The Diameter of the fore Foot, from the Right to the Left, was 14 ½ Inches; from before to behind, 16 ½ Inches. The Circumference of the fore Leg, at the Upper Joint, was 4 Foot 3 Inches (O. O.) At the Articulation of the *Carpus* 2 foot 6 ½ Inches (P. P.) the Circumference of the hind Foot, round the Hoof, 3 foot 4 Inches (Q. Q.) Its

Diameter from behind to before, 16 ½ Inches; from the Right to the Left, 12 Inches. The breadth of the outer Hoof, 4 ½ Inches (*b.*) the fore Hoof being Semicircular, 3 ½ Inches, (*a.*) the third and fourth Hoof 4 Inches each; both inner and outer Hoof go obliquely forward. The Circumference of the hind Leg is 2 foot 2 Inches, (R. R.) Thus you have the Dimenſions of all its External Parts, taken either from the Body, when it lay Dead in the Field, or ſince from the Stuff'd Skin, wherein for the moſt part they agree; only that by reaſon of drying, the Legs are ſmaller, and the Back not ſo protuberant.

The Cuticula *and* Cutis *deſcrib'd.*

Now I come to conſider the *Cuticula* and *Cutis*, being the firſt ſubjected to Enquiry. Dr. *Moulins* has already at large inſiſted moſt judiciouſly on both, and indeed he had good Opportunity to do ſo; for he had the choice of any part of the Skin he pleas'd, (to view its Structure) that was not defac'd by the Fire; whereas in our Subject, the chief endeavour of Provoſt *Yeaman* being to preſerve the Skin whole, in order to Stuff it, (which is now done to ſo good purpoſe and ſo lively, that it is become a moſt curious Ornament, as the Figure after the Original, which now ſtands in our Hall, doth repreſent) I had not an opportunity of making tryal upon any of it green; for on the *Monday*, while I was oblig'd to go out and take care of the Bones, the Workmen were buſied in ſalting and preparing it, and afterwards I had not time: So that what Accounts I can give you are taken from it, as it now ſtands dry. But that I may give you all the ſatisfaction I can, I ſhall tranſcribe what of Dr. *Moulin*'s Account I find agreeable to that I ſee in this Subject, and add my own Obſervations.

Dr. Moulin's *his Account of the Scabs.*

He ſays, ' he found the *Cuticula* cover'd all over with a ſtrange
' ſort of Scab, in many Places reſembling old Wrats, deeply jagged,
' and the carnous Fibres of the Muſcles of Beef when much boil'd
' and tranſverſly cut, but of a dirty tawny Colour. These Scabs
' (if they may be ſo call'd) both ſlit and look like ſhort pieces of
' Whale-bone; they did ſo firmly ſtick to the *Cuticula*, that they
' could not be pluck'd from it, nor the Parts of which they con-
' ſiſted (tho' they were much divided) from one another, with-
' out tearing it, and yet the *Cuticula* was very tough and
' thick-

Their length in his Subject.

This is very lively expreſt, and Anſwers exactly to what I find in this Subject. He goes on, and ſays: ‘ The length of theſe Scabs was in ſome above $\frac{1}{5}$ or $\frac{1}{4}$, but in other places not above $\frac{1}{10}$ or $\frac{1}{12}$ of an Inch. The cauſe of which difference, he takes to be the *Elephants* wearing, by rubbing or lying, ſome Parts of them, while others were ſlightly, or not at all worn.

In ours, Tab. 3. A.B.

The Scabs of this Subject were not ſo long; for as the deepeſt I could find upon the *Cuticula* was not above $\frac{1}{6}$, ſo the thinneſt was leſs that $\frac{1}{16}$ of an Inch; but that is not material. As to his Reaſon why they are thicker in ſome Parts than another, tho' it may ſeem pretty good, yet I ſhall offer another by and by, as a no leſs probable Conjecture.

The Hairs in his.

He ſays, ‘ He could find but very few Hairs without this Scab, but many within, and even with it. The *Elephants* Inclination to Itch, and to rub himſelf againſt whatever came in his way, kept thoſe Hairs that were even with the outſide of the aforeſaid Scab, from appearing of any conſiderable length. The hardneſs of the Scab, by keeping the Roots of the Hairs faſt, did very much contribute to their wearing on the outſide, as well as to their Preſervation on that within.

In ours.

In our Subject the Hairs are every where pretty long, ſome 2, ſome 3 Inches; others (in Places moſt Subject to Rubbing, as the Doctor obſerves) but 1 or $\frac{1}{2}$ Inch, tho' indeed not ſo numerous as I find. There are Paſſages for them through the *Cuticula*. I know not what the Doctor means by diſtinguiſhing between thoſe found in the *Cutis*, and thoſe in the *Cuticula*, ſince I am convinc'd all ariſe from the *Cutis*, and penetrate the *Cuticula*. They are indeed black, and many of them ſtiffer and thicker than thoſe in an Hog. As he by the Fire had occaſion to obſerve ſome pieces of the *Cuticula* rais'd from the *Cutis*, ſo the Skin of this Subject is in many Places depriv'd of it, eſpecially where the Beaſt lay moſt in the Water at its Death; and ſince theſe are means whereby to ſeparate the one from the other, this may give occaſion to enquire by what means they adhere: But I muſt firſt conſider the Structure of the *Cuticula*, and then of the *Cutis*. You know ſome have taken the *Cutis* to be nothing but a certain Cruſt form'd of ſeveral Mucilaginous Particles, obducing the *Cutis*, &c. in the *Uterus*; which after the *Fœtus* is come to greater maturity, is condens'd and form'd into a Skin, ſuch as we ſee *Mucilages* and *Pulteſes* have, when after boiling they are expos'd to the Cold: Others, that the *Cuticula*, as well

The Structure of the Cuticula.

as *Cutis*, is compos'd of a *Congeries* of *Membranous Fibres*, intermixt with a great many *Capillaries*, and endued with Pores fit for Perſpiration: And there are Anatomiſts who aſſert, they have injected theſe Cutaneous Veſſels in the *Cuticula* of a *Fœtus*, as well as in the *Cutis*; tho' when the Animal is more adult, theſe *Capillaries* not only eſcape the view of the naked Eye but even of Opticks. That this has been the Structure of the *Cuticula* in this Animal, is moſt plain and obvious; for tho' I cannot determine its thickneſs, as Dr. *Moulins* might have done in a recent One, yet now as it is dry, it ſeems to be of the thickneſs of, or rather thicker, than common Vellum, with its inner Surface excavated, as you ſee a Woman's Thimble, (the Holes being much about the ſame Bigneſs, and diſpos'd regularly) or in an Honey Comb. Among the Interſtices of theſe Excavations, the Ramifications and Divarications of the Blood Veſſels are obvious. At every two Lines or $\frac{1}{6}$ of an Inch diſtance, for the moſt part are to be obſerv'd Protuberances compos'd of 5, 6, or 7 Columns joining, and making up a Pyramid or Cone; in the top whereof is the *Pore* or *Ductus*, mention'd by Dr. *Moulins*, through which the Hairs paſs; they are nothing but the Interſtices of the *Favi*, (ſo to call them) or Depreſſions, which ariſe in the *Cuticula*, and are impacted in the *Cutis*, for the better Reception of the Hair. And 'tis probable, that all the Hairs are cover'd over with thin Membranes, as Dr. *Moulins* obſerves, from the Extremity of their Roots to the *Cuticula*; becauſe having pull'd out ſeveral of the Hairs, I ſaw them included within their proper *Involucra*, and doubt not but it was ſo with all the reſt too, beſide the common one which is both contiguous and continuous to the *Cuticula*. The Hairs are more looſe, and the Pores more patulent and obvious in the *Cuticula* now dry'd, than I ſuppoſe they were when recent; but whether theſe Pores were alſo deſigned for Separation of Vapours by Perſpiration, or only to contain, and convey the Hairs planted in the *Cutis* through the *Cuticula*, is what I ſhall neither contradict not affirm. To the outſide of this *Cuticula* are adherent the Scabs, which I rather take to be a Supervenient Diſtemper incident to this Animal, when out of its own Climate, occaſion'd by the Conſtriction of the Pores from Cold, than any wiſe Natural to it: And to this the Accounts of all Authors agree; who tell us, that there are two kinds of them, one of a more dark Colour, and another duskiſh and ſad, having both their Skins of a very ſmooth and polite Surface; wherefore

Tab. 3. A.

The Cauſe of the Scabs.

fore the Keepers of this *Elephant* with us, call'd it the *White Elephant*, in oppoſition to the black ones; whereof *Horace*, in the forecited Place, ſays, *Nigris digniſſima Barris:* But after they are affected with the Scab, this Diſtinction of Colours is not obſerv'd. Authors tell us, as you have heard, that the firſt thing they do when they begin to Tame them, is to anoint them with Oyl, whereby they keep their Skin ſmooth, ſoft and flexible, and relax their Pores ſo, that whatever groſs Particles may fly off from their Blood, whoſe Conſtitution is now perhaps worſe by the alteration of Dyet, and hardſhips they undergo at taming, may not ſtick to the Skin, but freely be evaporated. And I am credibly inform'd by ſuch as have liv'd long in the *Indies*, that they take as much care to keep the Skins of the *Elephants* ſmooth and clear, as we do with our fine Horſes. Since then theſe Scabs are a Diſeaſe, and not Natural to the Animal, it is reaſonable I ſhould enquire into the Cauſe of them; which to me ſeems to be *à Craſſitie & Viſcoſitate Sanguinis*, whoſe Particles, becauſe of obſtructed Pores, by a Cold too exceſſive for their Body, do not ſo eaſily fly off; but after they have paſt the *Cuticula*, go no further than its Surface; and becauſe of the *Viſcoſity* of their Texture, do ſo cleave to and heap upon one another, that they appear under the form of a Scab; which by the Evaporation of the more humid Particles, harden by degrees, and by the heat of the Sun are crack'd, rent, and divided: That Coldneſs of the Weather will occaſion groſs and viſcuous Blood, there's none acquainted with the Diſtempers in theſe Northern Countries will readily deny; nor that moſt of theſe Diſtempers proceed from the Obſtructions of *Capillaries* and *Pores*, and that this may be the cauſe of theſe Scabs. I offer only this one Experiment; whatever Pieces of the *Cuticula* I obſerv'd, where the Scabs were thin, there the *Favi* or Depreſſions were large and conſpicuous; but where they were very thick, there the *Favi* were very ſmall, and almoſt imperceptible; which plainly implies, that wherever theſe Particles avolate freely, few adhere to the Surface of the Skin; but when their Force is inhibited by the ſtrictneſs of the Pores, they are unable to remove any further than they adhere to, and augment the *Moles* of the Scab. Theſe, as is ſaid, are divided from one another by ſeveral *Rimæ*, or Rents, which may either be occaſion'd by the afore-mention'd heat of the Sun, or by the different Poſture the Skin is put in by the ſeveral Motions of the Body. Hence it is, that where the

The Scabs divided into ſeveral Rimæ.

Skin

The Conſtitu-tion of the Elephant's *Blood.*

Skin is moſt wrinkled, theſe *Rimæ* are moſt frequent. It may be ſaid, that this Reaſoning ſeems to contradict what Dr *Moulins* has aſſerted, *viz.* That this Animal has a very ſubtile Blood, abounding with a penetrating Urinous Salt; which he proves from the Vivacity of the Species, from the Urinous *Effluvia* which affected his Noſtrils, and from the ſmarting of his Finger by the Blood, after it was cut. As to the firſt, that it is a very Vivacious and Spirituous Animal, both the foregoing Relation and the Account of all Authors make it apparent; but that does not hinder its Blood from being incraſſated by Cold and bad Dyet, nor that theſe Scabs may proceed from this groſs Blood. As to the ſecond, tho' he might have been ſenſible of an abounding Urinous Salt in that Animal, it does not follow it ſhould be ſo in all, and I am apt to believe it was extraordinary; for without doubt ſuch a burning as the poor Beaſt underwent, even to its Death, muſt have alter'd the Conſtitution of its Blood, and made it quite different from what it was; and 'tis probable, that it was at ſuch places, as were moſt affected with the Burning, where he felt this Urinous Smell, and the ſmarting of his Finger. For my part, I obſerv'd the Blood of this Subject to be Styptick and Reſtringent: So that when my Hands were imbru'd in it, I could ſcarce bend a Finger; which Effect I have alſo perceived at the Diſſection of Fiſhes, which all acknowledge to have viſcuous Blood. But it may be objected, that this our Subject dying *Morbid*, and of a languiſhing Diſtemper, the Blood of the one might be groſs and viſcuous, and yet that of the other Spirituous and Subtile. I ſhould be ready to acknowledge the Objection to be valid, if I did not underſtand both were affected with the ſame Scab, and by what appears, the other ſeems to have been more than this.

The Structure of the Cutis.

I proceed next to the *Cutis*, whoſe inner Surface Dr. *Moulins* obſerv'd 'To abound with a great many Glands; when cut 'through, at leaſt as far as the Roots of the Hair went, it was 'like the horny or callous part of Brawn, and its outer Sur'face abounded with a great many *Papillæ*. As I ſaid, I had not opportunity to obſerve any of theſe; but am apt to believe all to be true: And firſt, as to the *Papillæ*; I told you already, that the *Cuticula* was endued with a vaſt quantity of *Favi*, or Depreſſions, wherein I doubt not but theſe *Papillæ* were receiv'd, tho' the Surface of the *Cutis*, as now dry'd, is ſmooth; and where the *Papillæ* ſeem'd to have formerly been, there are now rather

Depreſſions than Protuberances. This is an Argument that there has been ſome kind of Liquor contain'd in theſe *Papillæ* or Veſſels, as I may call them, which at the drying of the Skin is evaporated; and therefore I ſuppoſe this brawny part of the *Cutis* to be a *Congeries* of *ductus excretorij*, running in a Parallel Line from theſe Glands to the Veſicles, and conveying the Liquor to be contain'd in them, till it be evaporated by Perſpiration; and theſe Veſſels ſeem to have been both ſo big and numerous in this Animal, that they make up at leaſt two parts of the inner Surface of the *Cuticula*; the Blood Veſſels and the Depreſſions together ſcarce make up a third part. They ſeem alſo to be lodg'd in the *Cutis* by the one half, and in the *Cuticula* by the other; for in ſome Places of the *Cutis* I obſerved the Depreſſions as numerous, and ſeemingly Parallel to thoſe in the *Cuticula*; and that, notwithſtanding the *Membranulæ*, where the Humour was included, which now being dry'd and collaps'd, may take up ſome Space in the Depreſſion of the *Cutis*. By this Account both of the *Cuticula* and *Cutis*, I come to enquire Firſt, how the one ſhould ſo firmly adhere to the other, when there ſeems to be no Communication by Fibres betwixt them, as appears by their eaſy Separation both by Fire and Water: Secondly, how conſiderable the Perſpiration may be. As to the Firſt; ſince the *Cutis* and *Cuticula* are two diſtinct Membranes, their Coheſion ſeems to be mutual: Firſt, theſe Pyramids, which receive the Hairs, are impacted in the *Cutis*, and cloſely ſurround their Roots; and then theſe *Papillæ* are impacted in the *Cuticula*, which ſo long as they are diſtended with the humour fit for Perſpiration, will not readily quit the Depreſſions in the *Cuticula*, unleſs the Humour be ſuddenly evaporated by Fire, or the Sides of theſe Depreſſions or *Cellulæ* be relax'd by Water; and there may be a certain Viſcoſity which obduces the Surface of both, as it were ſo much Glue, which either the Fire may dry up too much, or the Water dilate; ſo that the one can be ſoon ſeparated from the other, and the Hairs either be pull'd from their place, or quit their common *Involucrum*. As to the ſecond, *viz.* The Perſpiration, I ſhall offer no other Calculation than what is already made by Dr. *Moulins*: He ſays, 'the Pores muſt be both numerous and 'large for Perſpiration, eſpecially if we conſider *Sanctorius* his 'Statical Obſervations of a Man's inſenſibly perſpiring in a Win- 'ters Day ℥50. and upwards; which is ſomething more than $\frac{1}{54}$ of 'an ordinary Man's weight, ſuppoſing him to be 170 ℔. and

‘ at this rate we muſt ſuppoſe an *Elephant*'s Perſpiration to be ‘ vaſtly more; but (as he ſays) 'tis probable, the Scabs might ‘ bar it from bearing proportion to that of a Man's: So that whatever the *Elephant* might have perſpir'd in an healthly State, we may reaſonably ſuppoſe it to do much leſs, when attacked with this Diſeaſe; which may be another Argument for the *Craſſities & Viſcoſitas Sanguinis*, wherewith I alledg'd this Animal I diſſected, was endu'd.

I can determine nothing about the thickneſs of the Skin, while recent; but as it is dry, by an Inciſion made upon one of the Hips, it appears to be leſs than ¼ Inch, and of Subſtance not unlike to *Engliſh* Bend or Sole-Leather.

The Cutaneous Veſſels.

I had no opportunity to obſerve, whether there were any Cutaneous Veſſels, but doubt not but there have been of them, and that in abundance; 1. from the numerous *Glands* diſpers'd all over its inner Surface, which muſt have had Blood Veſſels inſerted in them; and 2. from the abundance of *Ramifications* diſpers'd in the *Cuticula*, proportionable to which, it is probable, they were alſo in the *Cutis*.

Panniculus Carnoſus.

I can ſay nothing about the *Panniculus Carnoſus*, neither am I fully convinc'd of what is related by Dr. *Moulins*, *viz.* That this Animal kills the Flies, by putting itſelf ſuddenly in a Poſture to wrinkle the Skin on that ſide that is attacked by them; ſo that the Cracks are forc'd cloſe together, and the Flies bruis'd; for 'tis hard to conceive ſuch a big Animal ſhould all on a ſudden be ſo nimble. I rather believe, that the *Proboſcis* from before, and the Tail from behind, may ſupply the defect of the *Panniculus Carnoſus*, (if it be wanting:) For if we conſider the length of each, we ſhall find they come near to meet about the middle; for the Body of this Subject being 10 foot in length, the *Proboſcis* and Tail make up between them near 9 of it; and what is wanting, the Air, by the force of their motion, is enongh to expel the Flies, even when without their reach.

Fat.

As to the *Fat*, whether by reaſon of the extraordinary Leanneſs of this Subject, or if it be ordinary for *Elephants* to be endued but with little of it, I know not, but I could not have believed ſo little Fat to have been in any Animal as was here; for beſide that there was neither a *Membrana Adipoſa*, or conſpicuous *Omentum*, there was not one Grain of Fat, either among the Interſtices of the Muſcles ſurrounding the Kidneys, nor round the *Anus* and *Vagina*, where 'tis uſually found; and what is more, when I had ſpent near a whole Day in boiling the Bones in a Dyers Veſſel, without changing the Water, except that I ſupply'd what was evaporated, there was not ſo much as a Drop of Oyl that did ſwim upon the Liquor.

Dr. Moulins Account of the Membrana Nervoſa.

Dr. *Moulins* takes Notice of a very ſtrong Nervous Membrane, (which I ingenuouſly confeſs I had not time to remark, and therefore you have it in his own Word,) which obliquely deſcended from the *Spina Dorſi* to the *Sternum* and *Linea alba*. ‘ This Membrane was very tough, and near as hard to be cut as Whalebone of the ſame thickneſs; which all along the Back-bone was about $\frac{1}{6}$ Inch, but nearer the end I try'd it, the thinner I found it. This Membrane ſeem'd to terminate in the *Linea alba*, as the Tendons of the Muſcles of the *Abdomen* uſually do. Its Nervous Fibres were very diſtinguiſhable, and might eaſily be ſeparated throughout their whole length. This doubtleſs was to ſtrengthen the Creature, and perhaps that the weight of the *Viſcera* contain'd in the *Abdomen*, ſhould not diſtend the *Peritonæum* and Muſcles adjoyning, ſo as to let them hang lower than was convenient. A like piece of Mechaniſm you may remember I communicated to you not long ago, in my Obſervations made upon the Diſſection of a *Porpeſs*.

Deſcription of the Muſcles of the Proboſcis.

After the Skin was wholly remov'd, there being no Time to examine all the Muſcles of this huge Body, I apply'd my ſelf particularly to thoſe of the *Proboſcis*, as being of greateſt Moment. Wherefore the Body being Supine, I firſt conſider'd the Neck, and upper or fore-part of the *Sternum*, where I obſerv'd two Pair of Muſcles to ariſe ſharp and fleſhy; whereof two in the middle, from a ſmall Origin, were extended into large Muſcles, running ſtrait forward, and diſtinguiſh'd from each other by a white Line, till they came to the point of the lower Jaw; their other ſide running obliquely outward, till they came over againſt the Articulation of the Lower Jaw with the Upper: From thence keeping the lower part of the Lower Jaw, they return'd to the foreſaid point, in Figure not unlike the *Cucullaris* in Human Subjects, with their Fibres running obliquely forward from this middle Line toward their external part. This Pair ſerv'd to draw back the Lower Jaw, and like the *Platyſma Myoides*, cover'd all its other Muſcles, with thoſe of the *Larynx*, Tongue, and *Pharynx*. On the outſide of this Pair aroſe two other Muſcles, ſmall at their beginning, and in their Progreſs paſſing in betwixt the *Os Zygomaticum* and Scull, adhering to the *Muſculus Temporalis*, and

Retractores Proboſcidis.

aſcending run up below the *Meatus Auditorius*, half way betwixt the Orbit of the Eye and Top of the Head; where becoming very thick and round, it paſt over a ſharp Angle of the Scull toward the Forehead; whence deſcending from above the Eye, it came, and with its Partner fill'd up that hollowneſs in the *Os Palati* (k.) and coming ſtill lower, made up the back part of the Trunk or *Proboſcis*. Afterwards the Body being turn'd over, I had opportunity to ſee the *Tax Wax* mention'd by Dr. *Moulins*; which ariſes from a *Spina* in the back part of the Scull (c c.) whence running backward along the Sides of the ſeven *Vertebræ* of the Neck, it terminated betwixt the 6th and 7th *Vertebræ* of the Back, becoming ſtill thinner in its Progreſs. It was about ſix Inches broad, pretty thick, and deſcended obliquely from the Top of the *Spinæ Vertebrarum* to above the Ribs, and cover'd all the Muſcles which ariſe from the Neck, and ſupport the Head; aſſiſting them, (as Dr. *Moulins* rightly obſerves) becauſe the Heads of Quadrupeds, eſpecially of this Animal, being more pendent, have more need of Supporters than the Head of a Man, where this Contrivance is wanting. Dr. *Moulins* tells us, that it was plac'd edgewiſe; the Reaſon of which may be, becauſe of the *Spines* of the four firſt *Vetebræ* of the Back, which are 4 Inches broad; whence the *Tax-Wax*, running forward (where the Spines are narrow, or where there are no Spines at all, as in the three firſt *Vertebræ* of the Neck) in a ſtreight Line to the Scull, the ſpace below it for the Muſcles to move in, muſt be the ſame at the Neck as at the *Spina*, where the *Epiphyſes* keep their Upper Sides at ſuch a diſtance. From above this *Tax-Wax* in the Neck, do ariſe two Muſcles, thinner and narrower at firſt, but thicker and broader as they go to the Scull, where they firmly adhere to the Sides of a large *Sinus* in its back-part (b b.) whence aſcending, being lodg'd in the Depreſſion upon the top of the Head, and betwixt the Eminencies (d d.) they deſcend till they come over againſt the Hole for the Root of the Trunk (a.) and become thicker and round, and in their whole Deſcent make up the forepart of the Trunk with extremity.

Tab. 3. Fig. 1.

Tax Wax. Fig. 6.

Elevatores Proboſcides.

Fig. 6.

Fig. 1.

Thus you have the *Proboſcis* trac'd from its Origin; *viz.* That 'tis compos'd of two Pair of Muſcles; one whereof makes up its back-part, which ariſes from the *Sternum*, and paſſes with ſtreight Fibres in below the *Os Zygomaticum*; and from thence forward, till it makes up the Body of the Trunk itſelf. Another Pair, which ariſing from the Neck paſſes over the Head, and deſcending makes up its forepart. The Fibres of this Muſcle deſcend in a ſtreight Line, till they make up the Body of the Trunk, and then begins a ſtrong tendinous Interſtice, by which they are ſeparated from their Copartners; whence their Fibres deſcend obliquely to another ſtrong Interſtice, by which on each ſide they are ſeparated from their Antagoniſts, where the ſame oblique Courſe of Fibres is again to be obſerv'd, that is to ſay, that the *Erectores Proboſcidis*, (for ſo we may call theſe which make up the fore-part of the *Proboſcis*) (gg) unite in a tendinous Interſtice (cc) *Fig.* 7. from whence the Fibres on each ſide obliquely deſcend: So likewiſe the *Retractores Proboſcidis*, for ſo we may call theſe which make up the back-part of the *Proboſcis*, have their tendinous Interſtices running down the middle of its back part; from whence the Fibres obliquely deſcend, almoſt making an Angle of a *Demirhombus* on each ſide in another longitudinal tendinous Interſtice, whereby the Fibres of the antagoniſt Muſcles are conjoin'd.

Thus you ſee a wonderful Contexture of 4 Muſcles, ſo contriv'd as to perform all kind of Motions; for as either in the *Femora* or *Humerus*, from Flection, Extention, Adduction and Abduction, proceeds a circular Motion; ſo here when the Elevator and Depreſſor, or Retractor act together on either ſide, then there is a lateral Motion: And when the Congener *Elevatores* and *Retractores* act, then there is either Elevation or Depreſſion; and from theſe two, with lateral Motions on both Sides ſucceſſively perform'd, proceeds a circular Motion. But this is not all; we ſee that any part of the Trunk, either Root or Extremity, or both at once, can be bended either upwards or downwards; and this I conceive is perform'd after this manner. Theſe Fibres thus obliquely ſituated, are divided into ſeveral *Faſciculi*, which are ſeparated by ſeveral tendinous Interſections; and that at the beginning of each Interſection, there is a conſiderable Branch of a Nerve from the hard Portion, inſerted, by which one, two, or more of theſe *Faſciculi* may be ſet in Motion, without any other part of the *Proboſcis* being concern'd.

Dr. *Moulins*, and not unfitly, calls the *Proboſcis* a Prolonged Noſe, both from its Situation and Uſe in Smelling and Breathing. And I think I may with good Reaſon make an Analogy betwixt it and the Tongue: For beſides there is a great Affinity betwixt the Smelling and Taſting, ſince what's unpleaſing to the Noſe, cannot but nauſeate the Tongue and Palate; inſomuch, that the Noſe may be call'd a Taſter to the Taſte: They likewiſe agree in this Animal, by reaſon of the Diverſity of Motions in both, and few Muſcles that perform them, tho' elegantly expreſs'd by the famous *Bellini*: '*Quis credat*, ſays he, *huic tantummodo Univerſæ Linguæ (Proboſcidi) munia deberi, ita ut pauciſſimis donata Muſculis innumeras prope dixeram obire Motiones; Extenditur, Contrahitur, Dilatatur, Exeritur, Atollitur, Deprimitur, Incurvatur, modò in Cavum aptat ſeſe, modò in Convexum, modò uſque ad Palati Fornicem (Surſum) erigitur, modò ad Frænulum uſque (Deorſum) reflectitur, quandoque Duplicatur, aliàs Extenuatur, modò tremit.* By which only the Variation of *Proboſcidi* for *Linguæ*, *Surſum* for *Uſque ad Palati Fornicem*, and *Deorſum* (that is downward, when it is brought in betwixt the Fore-Limbs, or conveys any thing to the Mouth) for *Frænulum uſque*, all the Motions of the one are compatible to the other. And *Schotto* gives a brief Account of the Motion of the *Proboſcis*: '*Circumvolvit eum undique & maxima cum celeritate, eâ capit Potum & Cibum atque in Os mittit; nam Proboſcide non edit, ſed Ore; nec Ore nec edere aut bibere poteſt abſque Promuſcide; hinc Manus Naſuta vocatur. Suo enim Rectori erigit & offert ut conſcendat; eâ Arbores proſternit; eamq; cùm Aquis immergit, erigit; eâque reflat atque reſpirat.* Now to make a further Analogy with the Tongue and it: As the *Geneogloſſis*, by lengthening its Fibres from the fore and inner part of the Lower Jaw, whence it ariſes, to the Root of the Tongue, where it is inſerted, ſtretches it forth; So the *Levatores Proboſcidis*, by lengthning their Fibres from the *Tax-Wax* all along the Top of the Head to the Root of the Trunk, ſtretches it forth alſo: And as the *Retractores Proboſcidis* can very well perform the Motions of pulling it in, *Analogous* to the *Stylogloſſis*; ſo the two Antagoniſts on either ſide can pull it to the adverſe ſide, that it may perform the Actions of the *Ceratogloſſis*, while the Congener *Retractores* can pull it to that ſame ſide, where they act, as is ſaid. When I ſay, that the Fibres from before and behind deſcend obliquely from the tendinous Inſertions at the middle to thoſe at the ſide, I do not mean that they run ſimply ſo, but that the Fibres of each Muſcle are diſpos'd into different *Strata*, and that theſe *Strata* do interſect each other, like Lozenges, or as we ſee the Fibres in the *Muſculus oblique Aſcendens* interſecting thoſe in the *Muſculus oblique Deſcendens Abdominis*, and ſo on; that is to ſay, whereas one Series of Fibres ſeems to deſcend obliquely, the next underneath that aſcends again, and ſo conti-

Mirab. Animal. Terreſt. lib. 8.

nues throughout the whole thickneſs of each Muſcle. As to the circular Fibres ſpoken of by Dr. *Moulins*, I do not know I ſaw any, neither do I think them neceſſary for pulling up the Trunk, or deminiſhing it as to its length: For the great diſtance betwixt the Origin of theſe Muſcles, and their Inſertion at the Extremity of the Trunk, the longitudinal Poſition of their Fibres till they come to make a part of it, and the ſpace they have to act it, and to ſmell their Belly, and their oblique Inſertion in theſe tendinous Lines, may be look'd upon as ſufficient to perform this motion; and 'tis obſervable for this end, that the Skin is divided into ſeveral *Plicæ* or *Links*, as we ſee in a Worm, when ſhe draws up and ſhortens herſelf. Thus I conceive the forenam'd *Faſciculi* may at the beginning extreamly begin to be contracted, then the *Faſciculi* next to them, and ſo in order till they come to the Root of the Trunk; by which ſucceſſive Contractions the Bellies of all the Muſcles begin to ſwell, and ſo their Fibres diminiſh as to their length: And there needs no more for ſtretching forth the *Proboſcis* thus contracted, but the Fibres to reſſle to their former Poſition; which it may do with the ſame ſwiftneſs, as we ſee a Bow doth by its Elaſticity when once it is ſhot.

The Cavities of the Proboſcis.

Theſe Muſcles ſurround two large Cavities 2 Inches Diameter from the Right to the Left, and 3 Inches each from above to below, about the middle of the *Proboſcis*; for as they proceed from the Scull they are very wide, according to the Capacity of the Hole in the fore part of the Scull, whence the *Proboſcis* proceeds; of which hereafter. They are divided by a ſtrong *Cartilaginous Septum*, which runs ſtreight from before to behind, along the middle of the *Proboſcis*. This is the *Septum* whereinto the Muſcles ſituated in the fore and back part are inſerted. Theſe Holes are Cartilaginous, all round obduced with ſeveral Nerves, whereof hereafter; and endued with a great many Glands for ſeparating a certain *Mucus*, wherewith the inner Surface is always bedew'd, to keep it moiſt and preſerve it from injuries of the Air it ſucks in at Breathing. Theſe two Cavities are of great uſe, for they draw up and contain as much Water as ſerves the Animal at once, which afterward it emptieth into the Mouth, as it were from a Tunnel: They ſerve alſo for Breathing, Smelling, and uttering the Voice. The *Proboſcis* is not equally great, but from 38 Inches in Circumference at the beginning, it becomes gradually ſmaller till it be 20 Inches at the middle, and at the Extremity 11 Inches. It has an hollow Cartilage, where

theſe

Tab. 3. Fig. 18.

theſe Paſſages terminate. Round this is a Cartilaginous Margin, which extends itſelf $1\frac{1}{2}$ Inch before, and terminates in a Point; and behind it has, as it were, an hollowneſs, wherein this Point fixes itſelf, and takes hold of any thing, as it were a Thumb paſſing in betwixt two Fingers, and keeps it during Pleaſure. This Cartilage is of great Strength, and by it the *Elephant* can take up any thing of great weight.

Its Blood Veſſels.

I come next to examine the Veſſels and Nerves of the *Proboſcis*. I do not find this Animal endu'd with any particular Veſſels for this part; but theſe here, Analagous to thoſe in other Animals, ſeem to be adapted for peculiar Uſes. In ſearching for the Origin of the *Proboſcis*, and how it proceeded from the Head, I ſeparated the *Relevatores Proboſcidis*; below which I obſerv'd four conſiderable Blood Veſſels, a Vein and an Artery from each ſide, lying upon and deſcending in a ſtreight Line above the aforemention'd Cartilages, and diſperſing their Branches *hinc inde* throughout the Subſtance of the Muſcles, with two large Nerves accompanying them. I had not time to trace their Origin, but do offer theſe probable Conjectures about them. The External Carotid Artery, which furniſhes Blood to the Muſcles of the Face and lower Jaw, has already ſuffer'd ſo many Diviſions and Subdiviſions in the vaſt Maſs of large Muſcles in this Animal, that 'tis not probable there ſhould yet remain a Branch ſo large and of ſo ſtreight a Courſe, as to be thus diſtributed in this part; and the Capillaries of the External Jugular are uſually ſo diſperſed throughout the extream Parts whence it receives the Blood, that 'tis not to be ſuppos'd they ſhould ſo ſoon form ſo conſiderable Branches, and theſe again unite into one Trunk at ſuch diſtance from the *Baſis* of the Scull, where the two Jugulars are conjoin'd: And beſides this, the Situation of the Carotid Artery and Jugular Vein is ſo low, and thoſe Branches I ſaw were ſituated ſo high, that I can ſcarce think the one proceeds from the other. It remains then, that I ſhould enquire from whence they come. 'Tis obſervable both in Human Subjects and Quadrupeds, that there is an Hole below the Orbit of the Eye in the *Ox Maxillæ Superioris*, through which the Superior Branch of the ſecond Diviſion of the 5th Pair of Nerves paſſes, ſurrounding in its Progreſs a Vein and an Artery; all which are diſperſed in the Muſcles of the Cheeks, Lips and Noſe, and furniſh Branches for the Roots of the Teeth of the Upper Jaw. This Hole is not ſo conſiderable in Human Subjects, but larger in Quadrupeds, eſpecially

ally ſuch as feed upon Graſs or Hay; inſomuch, that by the bigneſs of this Branch of the 5th Pair in an Oxe or Hart, we may reaſonably conjecture they have a partial Taſte, and a moſt acute Smell by the Upper Lip, the better to enable them to chuſe their Food: For at the Diſſection of a Calfs Head, you'll perceive both this Nerve and the Blood Veſſels much bigger than what might be thought requiſite for furniſhing either Blood or Spirits to this part, were there not ſome extraordinary uſe for both. Now in this our Subject there is an Hole in the *Os Maxillæ Superioris* (u) Fig. 1. (m) Fig. 2. (8.8.) Fig. 3. ſo remarkable for its *Tab.* 3. bigneſs, ſo commodiouſly ſituated, and ſo well guarded, that I have good Reaſon to believe it may be deſigned for Tranſmiſſion of the afore-mentioned Artery, Vein, and Nerve, and that all theſe are diſtributed into the Trunk: For if we conſider the largeneſs of this Hole for this Branch of the 5th Pair, as it is to be ſeen in the inner Surface of the *Baſis* of the Scull, whoſe Capacity is ſuch as to contain a Nerve of above twice the bigneſs of what we ſuppoſe it to have been; if we again conſider the *Crena* (x x) which paſſes betwixt the Hole for the ſecond Branch of this 5th Pair and the 3d (i i,) and how the Hole for the *Arteria duræ Matris* (k k) is only ſeparated from the Hole for the third Branch (i i) by a ſmall Boney *Septum*; we may ſuppoſe that this *Arteria duræ Matris* enters where the third Branch of the 5th Pair goes out, and ſends up one Branch (k k) which immediately enters the *dura Mater*, and another which runs forward in this *Crena* to the Hole for the ſecond Branch of the 5th Pair (h h.) and goes along with it, and paſſes out below the *Lamina*, which frames the upper part of the *Sinus* for the Orbit of the Eye (S) (2) and runs forward along with the ſecond Branch to this large Oval Hole; where after it is come, it aſcends obliquely in a *Crena*, to be ſtill ſeen in the Bone, till it comes to the Root of the *Proboſcis*, where it is diſperſed as above; and the Vein returning by the ſame Hole runs along with the other two, tho' it does not enter the Scull; but running backward, paſſes in below the foreſaid *Lamina*, and deſcends where the *Arteria duræ Matris* aſcends. I cannot poſitively determine the Capacity of theſe Blood Veſſels at the Root of the *Proboſcis*; but they were very conſpicuous, and could admit of a Gooſe Quill, tho' they were empty; and when they were full, I doubt not but they were above twice as big.

Its Nerves. This extraordinary part did not want for Nerves ſufficient for it, no more than Blood Veſſels: For firſt, it has the *Nervus Olfactorius*, whereof hereafter; whereby 'tis endu'd with a moſt acute Senſation of Smelling. 2dly, the aforeſaid ſecond Branch of the 5th Pair; which accompanying the Blood Veſſels, is with them diſpers'd throughout the whole Subſtance of the *Proboſcis*; by which it has ſo acute a Senſation of Touching or Feeling, wherewith this Member is more ſignally endued; and by which it avoids whatever is hurtful to it, as appears by that memorable Inſtance of Dr. *Moulins*; who tells us, that ſuch was the Care, in that ſubject he treats of, for the *Proboſcis*, that it thruſt it two foot into hard Ground to preſerve it from the Fire. 3dly, the hard Portion of the *Nervus Auditorius*; which tho' it be diſpers'd in the Muſcles of the Face in Human Subjects, yet in Quadrupeds, ſuch as Oxen, it continues undivided, till it comes to the Angle of the Lips; and here we trac'd it a good way, running forward above the Temporal Muſcle, a little below the Ear, till it came to the Upper Lip; whence it proceeded to the fore-mention'd tendinous Interſtice, which runs down on each ſide of the *Proboſcis*, diſperſing a Branch to each of the *Faſciculi* of *Fibres* already nam'd. This ſeems to be chiefly adapted for the different Motions of the *Proboſcis*; for as we ſee in the *Muſculus Rectus Abdominus*, that at each of the tendinous Interſtices, whereby its Fibres are ſeveral times gather'd together, a Nerve enters at the beginning of each *Faſciculus*; So here the Muſcles of the *Proboſcis* being divided into ſeveral *Faſciculi*, each of them have a Branch of this Nerve diſpers'd in them; and 'tis ſituated on each ſide, that it may the more conveniently diſperſe its Branches both to the *Faſciculi* of the *Elevatores* and *Retractores* alternatively. The Head was ſo mangled at the taking it off, that we could not well find its Origin, as it proceeded from the proper Hole; but its Situation here, Analogous to that in other Quadrupeds, removes the ſuſpicion of its being any other than the hard Portion; tho' when I conſider'd its bigneſs, being as great as one of my Fingers, and the ſmall Hole through which it paſſes from the *Proceſſus Petroſus*, I was in ſome doubt about it; but when again I began to conſider its Texture, I was ſoon convinc'd it muſt be that and no other. 'Twas indeed very pleaſant to behold it, (for ſeveral Phyſitians and Surgeons of us being together, we cut off a Portion of it to know its Structure) how that ſeveral ſmall Fibres were knit together into one Bundle; and how ſeveral of theſe again were involved by common *Membranulæ* into different *Faſciculi*, till at length all were included in one common Tunicle. We indeavour'd by Microſcopes to view the Cavity of the Fibres, but could obſerve none: That which I ſuppoſe made it bigger, was, that when it paſt through the Bone, the *Faſciculi* were more ſtrictly coherent to one another, whereby they occupied a leſſer ſpace; but no ſooner had they paſt it, than they began to be more looſely conjoined within the common Tunicle, by which the whole Nerve appeared to be bigger.

An Analogy betwixt the Proboſcis *and the Noſe in other Animals, Eye, and Tongue.*

Thus you ſee how ſignally this Member is endued with Inſtruments for the Performance of its different Functions. 'Tis the principal Seat of two of the Senſes, and partially partakes of the third: For by it the Animal ſwell'd; by it Feeling is perform'd, as by the Hands with us, wherefore the *Proboſcis* is not improperly call'd *Manus Naſuta*, as before we obſerv'd; and by it the 5th Pair of Nerves affords a partial Idea of the Taſte, to what Food it takes hold of, before it conveys it to the Mouth; and it has a great Analogy to the other two Senſes, *viz.* to the Eye, by its 3 Pair of Nerves, namely, one for its Seeing, analogous to the other for Smelling; one for its pathetical Motions, analogous to the acute Senſation, afforded to the other by the 5th Pair; and one for the Motion of its other Muſcles, analogous to the hard Portion of the other; and to the Tongue, as we have already ſhew'd at large, by its different Motions, and by its partial Taſte.

The Abdomen.

I come now to the *Abdomen*. Without having time to conſider its Muſcles, I caus'd it to be opened longitudinally; whereupon the Inteſtines jeated out in a confus'd Maſs; firſt the Paunches or Trypes, as I may call them, (being not unlike the *Omaſum* and *Abomaſum* of an Ox;) and then the ſmaller Inteſtines. Being earneſt to employ what Time I had in viewing the other Parts, I let theſe alone after they were extracted, till *Monday*: But then, as I told you, (by reaſon of their leanneſs, heat of the Weather, and emptineſs, there being nothing in them but a little chew'd Hay or Graſs) they were all ſpoiled; ſo that I could not receive any ſatisfaction of them, either as to their Structure, Figure, Dimenſions, or Number. The Figure Dr *Moulins* gives of a part of the *Colon* and *Rectum*, ſeems to be pretty good; for I took a great deal of them, and ſtretched them out upon the Ground: They were about $\frac{1}{2}$ foot Diameter; but I had not time to take notice of their preciſe length.

The Deſcription of the Uterus.

Tab. 3. *Fig.* 15.

I next apply'd my ſelf to the Extraction of the *Uterus* and *Bladder*, becauſe the *Partes Generationi Inſervientes* are the moſt taken notice of in Comparative Anatomy, I could not get the *Vaſa Præparantia* preſerv'd; and only got out the *Uterus* itſelf, with the *Cornua*, *Ovaria*, and part of the *Ligamenta Lata*, (*a. a.*) of all which ſee the Figure. 'Tis not unlike the *Uterus* of ſuch Animals as bring forth ſeveral at one Litter, as they call it; for when I had inflated it, I perceiv'd ſeveral Protuberances to ariſe, (*e. e.*) as if they had been ſo many *Cellules*, ſuch as Bitches, Cats, Hares, *&c.* have, for containing the ſeveral *Fœtus's* with their proper *Placentæ* and *Involucra*; which might have determin'd me to believe they bring forth more than one at a time, had not Authors affirm'd the contrary. For whereas the *Uterus* of ſuch as bring forth but one at a time, is proportionably large, and the *Cornua* ſmall; here the Body of the *Uterus* was ſo ſmall (*c.*) that one would think it were nothing but a *Bivium* to the 2 *Cornua*: For after the Tube had paſt the *Corona*, which is pretty

Cornua.

ſtrong and cloſe, I obſerv'd the *Cornua* (*f. f.*) to ſwell on every ſide by Inflation, leaving a *Sulcus* in the middle (*d.*) and theſe different Protuberances to ariſe with Depreſſions, as ſo many Interſtices betwixt them. This Furrow (*d.*) ſeem'd to me to point out the *Septum*, whereby the *Cornua* were divided from each other; and theſe Interſtices to denote, as it were, ſo many Membranes, whereby theſe Protuberances were bounded and

Cellules.

form'd into *Cellules*, each communicating with one another. Theſe Protuberances (*e. e.*) were regularly diſpos'd, 2 or 3 in Number on each ſide of the *Septum*; and tho' ſome of them be obliterated, yet the *Veſtigia* of others do ſtill remain obvious in the dry'd *Uterus*, as it is now repoſited in our Hall. I had a great Inclination to open one of theſe *Cornua* or *Cellules*, to know the truth of what I ſuſpected; but would not adventure, for fear of ſpoiling the Preparation. Each of the *Ovaria* was as big as a large Apple, with the *Ova* fitly diſtinguiſh'd by their proper Membranes; being for the moſt part about the bigneſs of a ſmall Pea, and all involv'd within a common thin and pellucid Tunicle, through which they Shone; but to defend them there was provided a looſe thick wrinkled Tunicle, (*i.*) which I could remove at pleaſure, it no wiſe adhering to the *O-*

Ovaria.

varia; but fluctuated above them, and proceeded from the *Cornua* (*g.*) I open'd one or two of theſe *Ova*, and found them filled with a thin Limpid Subſtance, not unlike to *Hydatides*, but that the Humour was more viſcuous; which is now evaporated in the dryed *Uterus*, and the *Ovaria* quite collaps'd. The Extremities of the *Cornua* which received the *Ova* were very narrow; for when I had inflated the *Uterus*, it retain'd the Air for ſome time, without paſſing immediately out by the *Cornua*; tho' afterwards when I had ſtrictly ty'd the *Vagina*, I obſerv'd the Air did inſenſibly ſlide out, and now and then I could ſee ſmall *Bullulæ* ariſe toward the *Ovaria*. I could not ſee any fluctuating *Alæ Veſpertilionum*, nor *Morſus Diaboli*; but do ſuppoſe, that the *Ova* are received into the Extremities of the *Cornua* by an *Hiatus*, below this looſe *Involucrum*, which I told you defended the *Ovaria*. I cannot determine the preciſe length of the *Vagina* (*b.*) becauſe I know not how much of it might have been cut off; nor Situation of the *Uterus*, becauſe the Body lay ſupine, and I was obliged to take the Aſſiſtance of Butchers at the taking it out. The *Vagina* was very ſmall and narrow, not admitting above two or three Fingers. Its Inner Surface was whitiſh, and moiſtned by a certain kind of *Mucus*, and all full of *Plicæ* or Wrinkles.

Ova.

The Bladder.

The *Bladder* is rounder than that of an Oxe, and much larger than Dr. *Moulins* would have it; for he ſays, 'tis much about the ſize of an Ox Bladder; but I find, when inflated, it can contain ſix or ſeven *Engliſh* Gallons: And I doubt not but I might have ſtretched it out larger, had I had ſufficient Inſtruments for inflating, for this I only did with my Mouth and Tube. 'Tis indeed very ſtrong, and the Veſſels appear very prettily diſpers'd through the Tunicles, which I could have eaſily ſeparated, but did not deſign to loſe it. The Ureters were about ½ of an Inch Diameter, and I could have eaſily diſcover'd their Inſertion, if I had not deſigned to preſerve the Bladder. Both *Uterus* and Bladder were involv'd within a Duplicature of the *Peritonæum*, ſo that I had much ado to get them ſeparated.

Since I have gone ſo far in giving an Account of the Parts for Generation in the Female, I hope it will not be unpleaſing, if I give Dr. *Moulin*'s Account of them in the Male, with my own Thoughts about them.

Dr. Moulin's *Account of the Male* Elephant *he diſſected.*

‘ In ſearching for the *Teſtes*, he found two Muſcles very like them, which he ſuppos'd to have been them, till he had trac'd them to the inner and lower ſide of the *Iſchion*, where he found them implanted: He trac'd the Tendons likewiſe, and found, that when they had gone ſingly near upon 4 Inches, they join'd

Muſculi duo Retractores Penis *D. Moulins, Pag.* 15.

' in one, which went directly under the middle of the *Penis*, and reach'd beyond a Crookedneſs he obſerv'd in it. This was in length about 8 Inches, and terminated within 6 or 7 Inches of the *Glans*, having expanded itſelf into a Membrane. There was beſide theſe a Nervous Body, that began underneath near the aforeſaid Tendons, about 8 Inches from the Root of the *Penis*, and reach'd (diſtinct from the Yard) 9 Inches, before it was inſerted again in it, at a place 5 ½ Inches from the *Glans*.

Their Uſe.

' He is of Opinion, theſe Muſcles in that Nervous Body being ſo conveniently plac'd for that purpoſe, that the *Elephant* is a Retromingent and probably Retrocoient Animal. The crookedneſs and bending downwards he obſerv'd in the *Penis*, ſomewhat ſhort of the end of the Tendon, and the confeſſion of thoſe that were his Attendants, who told him, that when the *Elephant* would make Water, they obſerv'd him to unſheath the *Penis*, and bend it backwards, and ſo Piſs between his Legs outwards, confirm'd him in that Opinion; by which, he ſays, Nature ſeems to prevent this unweildy Animal's wallowing in its own Excrements.

Remarks upon his Obſervations.

Had our Author had the good Fortune to obſerve the *Erectores Penis*, as well as its *Retractores*, it might have been of Service: For admitting there be ſuch, (as I have no reaſon to call ſo Ingenious a Gentleman's Authority in queſtion) 'tis probable there muſt have been *Erectores* alſo, and that upon the following Accounts. Firſt, becauſe 'tis requiſite the *Penis* of the *Elephant* be freed of this Retraction; that whereas it is brought back at the *Minctus*, it may be brought forward at the *Coitus*. 2*dly*, Becauſe it is requiſite that the *Penis* at the *Coitus*, be brought (if not altogether, yet) obliquely upwards: As we ſee when a Horſe Piſſes, he firſt unſheaths the *Penis*, which by its own Gravity declines, and if aſſiſted by a more than ordinary Supply of Spirits, it tends a little forward; but in the *Elephant* there is always a Supply of Spirits required at the *Minctus*, both to make the *Penis* penetrate the Sheath, (whoſe inner Orifice, as our Author ſays, was ſhut ſo cloſe, that there was not room for a Man's little Finger to get in, ſo that he was forc'd to divide it before he could come at the Yard) and endue it with a certain Rigidity, and to ſwell the *Retractores*, whereby the *Penis* being render'd a little ſtiff, may be drawn back. Suppoſing then there be ſuch *Erectores Penis*, we muſt likewiſe conceive them to be of a far greater force and bulk than the *Retractores*; for if, as according to our Author, the *Penis* at the *Minctus* be brought back far beyond the uſual Poſture of the *Penis* in other Animals, we may believe it alſo to be endued not only with Antagoniſt Muſcles to theſe *Retractores*, whereby to bring the *Pænis* to ſuch a Poſture as we ſee in Horſes, but alſo to make it aſcend ſo far as is requiſite for the *Coitus*. And if what I have elſewhere advanc'd be not ſufficient to prove this to be no Retrocoient Animal, I ſhall add the following Arguments: Firſt, The *Vagina* is not plac'd behind a little below the *Anus*, as in a Mare, but below, in a direct Line with the reſt of the Belly, whereby there is a Neceſſity for the *Penis* to aſcend. 2*dly*, The *Oſſa innominata* aſcend obliquely, which muſt oblige the *Penis* to do ſo too. 3*dly*, The Author's Account of the *Penis* itſelf, (for he ſays 'tis bigger than that of a Horſe, but not ſo long) ſo that it can hardly be ſuppos'd both to bend backwards, aſcend again, and enter the *Vagina* ſo far as is requiſite.

His Account of the Teſtes.

'The *Teſtes*, he ſays, were not contain'd in a *Scrotum* or *Capſula*, but lay in the *Perinæum*, cloſe joined on each ſide to the *Penis*. They were neither of the uſual ſhape, bigneſs, nor included in a *Proceſſus* of the *Peritonæum*. Their Shape was very like that of a Cheſtnut. They were thicker on the ſide that grew to the *Penis*, than on the oppoſite. They were flat and round, and not ſuitable to the other Parts of his Body, being no more than about 3 or 4 Ounces in weight. They were joined to the *Penis* by a great many, at leaſt 100 Seminal Tubes, which may be properly call'd *Vaſa deferentia*, and which depoſited the elaborated *Semen* in ſeveral *Rhomboid Cells*, plac'd in the Body of the *Penis*, which in this Creature was the common and only Repoſitory, where the Seed could be found. Theſe Cells were turgid with Sperm, and ſo were the Tubes The latter were very large, receiving a Block-Tin Wire of an equal thickneſs with the biggeſt ordinary Pins, or above an Inch, when the Tube was ſtreight, as moſt were; but being purſu'd further into the Body of the *Teſtes*, they became ſmaller and ſmaller, till they diſappear'd. The Blood came into the *Teſtes* by the *Vaſa deferentia*.

Our Author, as he proceeds, is ſomewhat perplex'd; and therefore I chuſe to continue in his own Words, that you may the better know his Thoughts of this part. He ſays, 'Though theſe were ſmall and diſproportionable, yet he took them to

‘ be the *Teſtes*, nothing elſe outwardly appearing that contain'd Seminary Veſſels; until he underſtood by the Curious and Learned Dr. *Needham*, that his Deſcription of the *Teſtes* of the *Elephant* did agree to the *Proſtatæ* of a Bear: Upon which he miſtook the *Teſtes* for the *Proſtatæ*, there being a great Reſemblance between theſe Animals; and having found two Subſtances betwixt the Kidneys and Neck of the Bladder, which might very well be *Teſtes*, and which, till he diſcours'd that Ingenious Gentleman, he did not know what to make of. And then he proceeds:

Venæ Præparantes.

‘ The *Venæ Præparantes* were large: He divided that which was inſerted into the Emulgent lengthwiſe; and within a little more than an Inch of its Inſertion he found many Valves, to the Number of about 8 or 10, of divers Shapes, all fitted to hinder the return of the Blood into the variouſly divided Spermatick Vein, which here from 8 or 10 Rivulets became one great Channel. Within about an Inch of this, and ſomewhat more than two from the Kidneys, he found a Subſtance of the Shape of a Pear, but near three times the bigneſs of a very large one. He was at a loſs to know what this might be, and confeſſes he can give but an imperfect Account of it, ſince the Butchers cut it out, and ſo its Continuation with the *Teſtes*, *Penis*, and other Parts, could not be diſcovered.

‘ What he obſerv'd in it was, that the Spermatick Veſſels entred but a little way into this Subſtance; but below the middle of it he found them more deeply plac'd, and their Branches grew ſo ſmall, and leſs numerous to the Sight, as if here the Veins began. The inner part of this Subſtance look'd of a paliſh, but ſomewhat muddy red Colour. 'Twas very Spongy, not much more compact than the Lungs of young Animals. He doubts not but this Subſtance was deſigned to prepare the *Semen*; but by what Veſſels it was brought to the *Penis* or any other Repoſitory, (itſelf containing none) he could not diſcover; neither could he find any peculiar Veſſel, or *Ductus*, or any thing that reſembled that before-mentioned Subſtance, by which he might be directed in his Enquiry. It lies lengthwiſe from the Kidney to the *Teſtes*, with the biggeſt end loweſt. He is of Opinion, from what he has heard from Dr. *Needham* of theſe Parts, that theſe two Pear-faſhion'd, now deſcrib'd Subſtances, were *Teſtes*; their Place, Size, Fi-

‘ gure, and occaſional Cutting the *Vaſa deferentia*, being the Occaſion of his former Ignorance in this Point.

‘ He could obſerve no *Veſiculæ Seminales*, nor any common Receptacle for the *Semen*, except the formerly mention'd Rhomboid Cells in the *Penis* itſelf; but doubted not there might be ſome ſtill, tho' his being intent upon other things made him neglect the Diſcovery of them. Thus He, as you find, ingenuouſly confeſſes his miſtake of the *Teſtes* twice, and he leaves them in doubt the third time: However, this may ſerve as a Precaution to ſuch as may have occaſion to diſſect ſuch a Subject as this hereafter, and therefore I thought fit to give you his Account in his own Words.

The Liver.

The *Inteſtines*, *Uterus*, and *Veſica*, being extracted, I laid aſide the two laſt, in order to a future Preparation, and went to extract the Liver, which you know takes time in other, and much more in this great Animal. Whether by the haſte made in taking it out, or not, the Liver of this Subject had any ſuch *Membrana Hepar inveſtiens*, as Dr. *Moulins* ſpeaks of, I ſhall not be too poſitive; but am ready to believe it had none, and that the *Membrana* mention'd by him is nothing but the proper Tunicle of the Liver, raiſed by Fire, as we ſhall ſee hereafter; and my Reaſon for thinking ſo, is, that I was very careful to have it taken out whole. 'Tis true, the Inteſtines being taken out in haſte, I had not ſo ſoon an opportunity of obſerving the *Ductus Cummunis*; but I viewed the reſt of the Liver exactly, and cauſed the Figure and Dimenſions of it upon the Place to be took, (being 36 Inches long, and 22 at the broadeſt part) becauſe it would not keep. I was indeed in great doubt, what to think of the *Veſicula Fellis*, when I did not find it. Both the *Vena cava* and *Porta* were very large, and had their *Exit* and Entrance in the concave Part of the Liver, as you ſee. This had only one Lob; but both the Veins diſpers'd themſelves, firſt into two large Branches, and then were ſubdivided there, as in the ordinary manner. I open'd ſeveral, and found them differ in nothing from other Animals; the Subſtance being firm, as is uſual, and *Glands* large and conſpicuous; the external Surface ſmooth, and its proper Tunicle firmly adhering to the *Glands*; which is all I obſerv'd in it. See the Figure. *Tab. 4. Fig. 10.*

But becauſe Dr. *Moulins* does tell us of a *Membrana Hepar inveſtiens*, I ſhall give you his Account of it; as alſo of the *Bile* and *Porus biliarius*, which I can give no Account of my ſelf. He ſays,

‘ The Membrane that inveſted the Liver, was raiſed from it a conſiderable way, as if it had been joined to it. Though this Membrane ſeem'd to be whole, and look'd like the *Cuticula* raiſed by a Bliſtring Plaiſter, yet there was no *Serum* contain'd in it; and where it ſeem'd to be intimately joyn'd to the Liver, by a gentle pull it came off, without tearing any thing that I could take notice of, as if it had been but very ſlightly faſtned to the Liver; or rather as a Bag, which contained and exactly fitted it. He takes the uſe of this to be chiefly to terminate the Capillary Veſſels, and prevent the gleeting of Serous Humours; and concludes, that he muſt wholly impute the clear in ſome Places, and in others that eaſy Separation of the Membrane from the Liver, to the Fire: By all which this ſeems to be nothing different from the proper Membrane which I obſerv'd, and you ſee the Circumſtance of firmly adhering and looſely inveſting.

His Account of the Bile.

The *Bile*, as he gives an Account, was depoſited at the end of the firſt Gut, 4 ½ Inches below the *Pylorus*; from whence he trac'd the *Ductus Communis* to the Liver, to ſee the *Veſicula Fellea*; but it was wanting, and in the place of it he found the *Porus biliarius* coming out of the Liver, as the *Ductus hepaticus* uſually does. He obſerv'd likewiſe, that the *bilis* found in that, differ'd both in Colour and Conſiſtence from that he found in the *Ductus hepaticus*; for the latter was of a clear light yellow Colour, congeal'd like a Jelly, and the former of a dark Green, and ſomewhat more fluid than the Gall of an Ox. He hopes Time will diſcover ſuch a difference in the Galls of moſt Animals, and that diſcerning Men will be excited to find out their Uſes.

I fail'd alſo to obſerve the *Pancreas*, becauſe it was taken away *in Cumulo*, with the reſt of the Inteſtines; and therefore ſhall give you Dr. *Moulin*'s Account of it too.

Of the Pancreas.

‘ The *Pancreas* was very long and large; for it reach'd from about the middle of the Stomach to the *Jejunum*, which ſpace could not be leſs than 6 Foot. 'Twas a *Glandula Conglomerata*, as the *Pancreas* always is, and had its *Ductus* ſo wide, that it could without force contain ones little Finger. It open'd into the Gut, where the *Ductus felleus* did. Whether both the Paſſages join'd into one before their Aperture into the Inteſtines or not, he has forgot. The *Succus* in the *Ductus* was not limpid, as it uſually appears, but of a very dark Green Colour, and yet very fluid, ſeeming to contain no viſcuous Phlegm.

The

Of the Spleen.

The *Spleen*, of which I had not time to take the Figure, was in this Subject 3 ½ Foot long: On the backſide its Edge was ſomewhat curv'd, almoſt in Shape of an unbended Bow: On the fore-ſide, from a narrow Point at each end, it enlarg'd itſelf by degrees, till it came toward the middle where the Veſſels entred, where it was broadeſt Whether the *Vena Splenica* went forth by one, two, or more Orifices, I cannot poſitively determine, it being cut off in haſte; and when cut off, I ſaw it ragged for the ſpace of 4 or 5 Inches; which I conceive to be becauſe of the Orifices of ſo many Veins. It was thin and flaccid; what Blood was preſs'd out of it, was blacker than any I had ſeen throughout the reſt of the Body. If it had not been unwarily cut by ſeveral ſlaſhes of the Butcher's Knives, I deſign'd to have blown it up and prepar'd it. I cut off a little of it, and preſs'd out of it Venal grumous Blood from ſeveral of its *Cellules.* It was in breadth from 3 Inches toward the Extremities, to 8 Inches about the middle.

Glandulæ Renales.

The *Glandulæ Renales* were plac'd after the uſual manner: They were about 5 Inches long, 2 Inches broad, and Oval, with a looſe outer Coat, which I remov'd, as it had been a Sheath; within which was contain'd the *Gland* itſelf, being divided into ſeveral Lobes, like the Kidney of an Ox; from whoſe Interſtices there paſs'd ſeveral thin *Membranes*, which paſſing to the looſe *Vagina*, kept it faſt; and by which this *Vagina* was only coherent with it. Its Veſſels were cut off ſo ſhort, that I could make nothing of them. I cut it longitudinally, and found in it a Cavity, which could contain about 2 Ounces, all full of a black grumous Blood, in Colour much like that I obſerv'd in the Spleen. I ſhall not much inſiſt upon the Uſe of theſe two *Viſcera*, about which there is ſo much debate; but only tell in ſhort, that it is probable, as the Spleen is to the Liver, ſo are theſe *Glandulæ Renales* to the Kidneys; that is to ſay, whereas the Blood after it is diſtributed into the Inteſtines by the ſeveral Arteries, which proceed from the *Aorta*, is receiv'd by the Orifices of ſo many Veins, as ſerve to make up ſo many *Radices Venæ Portæ*; it is convenient this Blood ſhould be animated by a new Supply of Spirits, the better to enable it to continue its Circulation in the *Porta* through the Liver, and diſpoſe it for the better Separation of the Bile; for which Uſe the Spleen ſeems to be adapted, both from its Situation in reſpect of the Liver, the Venal Blood of the one entring the *Porta* for the other; its Structure; *Mora* of the Venal Blood, after diſcharg'd from the Arteries; and a conſiderable Branch of a Nerve furniſh'd to it: So the Kidney being a *Viſcus* where there is a vaſt Separation of *Serum* required, theſe *Renes Succenturiati* ſeem to be deſign'd for furniſhing a new Supply of Spirits to the Venal Blood, after it has paſſed the Kidneys, and undergone this Secretion. Both which Uſes I doubt not may appear from their Structure, as you have it at large declared by thoſe accurate Anatomiſts, who have flouriſh'd in this Age.

Kidneys. The *Kidneys* were of a large and proportionable ſize, being one Foot in length and ½ Foot in breadth, of the uſual Figure, much like that of a Man; their external Surface ſmooth, and equal with their external Coat, cloſely adherent to the inner Subſtance, without any perſpicuous Lobes to be ſeen externally; but when I open'd one of them, I perceiv'd 6 large *Carunculi Vrinarij.* Its Subſtance was very obvious, and correſpondent to the Structure uſually obſerv'd in the Kidneys; *i. e.* the Glandulous Subſtance externally was very conſpicuous, for the ſpace of about ½ Inch in Circumference; then began to appear the *Tubuli Vrinarij*, firſt ſmaller and leſs obvious; then another Series larger, and a third ſtill larger, till they began to ſurround each of the *Carunculi*, like ſo many Rays of the Sun. I had no Aſſiſtance of Microſcopes, (for I open'd it in the Field on *Monday*) and therefore did not ſee ſo clearly the *Coalition* of the ſmaller *Tubuli* into the larger Ducts: But as it happens in all theſe Excretory Veſſels, they did not appear branched and divaricated, as Blood Veſſels uſually are; but continued parallel to each other, till from the leſſer to the greater, they at laſt emptied themſelves into the common Receptacles. I am not poſitive, whether there was one common Ureter, into which all the ſix *Carunculi* did empty themſelves, or if each had a particular Branch of an Ureter, into which they were diſcharg'd; only I remember I ſaw no *Pelvis*, which for the moſt part happens where the *Carunculi* are very large. The Reaſon of my uncertainty about the Ureters, is, that after I caus'd the *Thorax* and *Abdomen* to be open'd on the *Saturday*, I let alone the Kidneys till the *Monday*; but they being involv'd within a Duplicature of the *Peritonæum*, and no Fat ſurrounding them, that Membrane was ſo dry'd up and ſtiff, that even the Butchers Knives were ſcarce able to pierce it: So that requiring the help of a Butcher, who aſſiſted at the Excarnating of the Bones, he took out the Kidneys without any regard to the Veſſels; for the *Renes Succenturiati* were luckily taken out the

Day before, when all the Parts were ſoft and flexible. And here in general I muſt tell you, that the Fleſh of this Animal was for the moſt part ſo ſtrong, that no Launcet I had, how keen or ſtrong ſoever, could do any Service: So that I was forc'd to make uſe of Butcher's Knives, when I could not admit of their Hands; and how unfit ſuch Inſtruments are for Anatomical Preparations, I leave you to judge.

Thymus.

A Polypus *in the* Aorta.

I come next to the *Thorax*; where there was ſcarce any thing remarkable. I think I need not tell, that the *Viſcera* here were large and ſtrong. One of the Lobes of the Lungs was open'd by the Butchers, and the other had nothing obſervable, but its bigneſs, which was proportionable enough. It did not adhere to the Ribs, as in Dr. *Moulin*'s Subject; but lay flaccid on the one ſide of the Heart, as the other had done, before it was mangled, on the other ſide; ſo that I look upon this Adheſion of Dr. *Moulins* to have been in a morbid State. At firſt I deſigned to have taken out the whole *Viſcera Thoracis*, till the Butcher prevented me; and as I began to direct him between the two firſt Ribs, I ſaw two large Glands, one ſituated on the outſide of each of the *Carotides*, as they paſſed out of the *Thorax*; they were round, and near the bigneſs of a Turky Hen's Egg, each having a conſpicuous Artery inſerted, and a Vein paſſing from them. Theſe I took to be the *Thymus*; which, tho' ſeldom obſerv'd in adult Subjects, yet perhaps may at all times be ſeen in ſuch a large Animal as this. I cut off one of them with part of the adherent Artery; and could obſerve nothing at the opening of it, but ſeveral looſe thin Membranes without, which I ſuppoſe to have ſupported and contained in the Cavity (whoſe ſides they deſcribe as they run to and fro') a great deal of Fat, when the Animal was in good caſe; and a firm glandulous Subſtance within, without any Cavity. I ſhall not poſitively determine, whether theſe were actually the *Thymus*, or only adventitious Glands; but becauſe they were regularly ſituated, which ſeldom happens to adventitious Glands, 'tis probable they were. Their Veſſels were proportionable to their bigneſs, but I can ſay nothing to their Uſe. When I ſaw I could not extract the *Viſcera Thoracis* whole, I trac'd one of the Branches of the *Aorta aſcendens* down to the Heart; and was ſurpriz'd, when I cut it above, to ſee a fat-like Subſtance jeat out of it; and pulling it, I got upwards of 2 Foot in length of a *Polypus* adapted to the Capacity of the Artery, which was about 2 ¼ of an Inch Diameter. This *Polypus* was no wiſe fibrous, but as it were ſo much Fat moulded after ſuch a manner, being not unlike the Blade of a broad Sword, near to ¼ of an Inch at the middle, and much thinner at the Edges, tough and flexible, with ſome grumous Blood not ſo firmly compacted at the Extremity.

Heart. When I came to the *Heart*, I ſaw all its Veſſels very large; the *Bivium Aortæ* very conſiderably thick and ſtrong. There was nothing about the Heart remarkable, except the bigneſs, which was proportionable to the Body. The *Auricles* were large, and the Left as well as the Right full of grumous Blood At the opening of the *Ventricles*, I found them both fill'd with the ſame *Polypus*; which ſtrangely twiſted itſelf in among the Valves, both *Tricuſpides* and *Semilunares*, and alſo among the fleſhy Columns at the bottom of each *Ventricle*; which here ſeem'd to be ſo many little ſtrong round Muſcles, ſome ¼, others ½, and others near one Inch long, with a round fleſhy Belly, and two Tendons variouſly ſituated, as you ſee in the Hearts of other Animals. Theſe *Polypus's*, from a maſſy Subſtance in the middle of the Ventricle, ſent forth to all Parts their Branches, which here and there twiſted themſelves round theſe fleſhy Columns, their tendinous Inſertions, and the tendinous Fibres of the Valves, with a wonderful Intricacy. In a word, there was no Angle, no Corner or Cavity, which the *Polypus* did not occupy: And yet ſo much was it diſengag'd from the Subſtance of the Heart, and 'twas ſo ſtrong and tough, that by pulling its groſſer part in the middle, all the other Branches mov'd; and by cutting a few Parts of it, where it was moſt engag'd, and where the fleſhy Columns were thickeſt, I got it out altogether; and having ſtretch'd it out, did pleaſantly behold theſe Ramifications, proceeding from its groſſer part like ſo many Thongs or Laces whereinto a piece of Leather had been cut, ſome broad and ſome narrower; but none very thick; of a yellow Colour, and fat Subſtance; each of them weighing 1 ℔ which I may ſafely ſay, was more Fat than was upon all the Body beſide. From whence I may reaſonably conclude, that altho' it had not met with the formerly mention'd Hardſhips, however it might have liv'd ſometime, yet it could not live long, it being evident, that this *Polypus* would at length have prov'd its Ruin.

Polypus Cordis.

The Mouth Having, as I told you, but little time to take Notice of the external Parts of the Head, either in reſpect of the Muſcles which move it, the *Larynx*, *Pharynx*, or Tongue, or in reſpect of the

Salivatory Veſſels, which empty themſelves in the Mouth; I ſhall only tell you, that the Mouth is very little and narrow, in proportion to the Body, and that upon theſe Accounts: 1. Becauſe neither Lips nor Teeth are employ'd in gathering the Food, as in other Quadrupeds; ſo that the Mouth only ſerves to receive the Aliments from the *Proboſcis*, which both gathereth and conveyeth them into it. 2. The *Dentes Maxillares* are of ſuch a thickneſs, both in the Upper and Lower Jaw, but eſpecially the latter, that they ſerve to render the Mouth narrow; nor need it be broader, becauſe the Strength of the Grinders is ſuch, that that they can at once render the Aliments ſo ſmall, that there is no need for the Tongue to move them to and fro' in the Mouth, in order to have them further maſticated, as in other Animals; therefore is the Tongue ſmall, ſhort and round, terminating in a Point, thick, and not thin and flat as in Oxen, with a ſoft ſmooth Surface, without any perſpicuous *Papillæ*; by which it ſeems not to chew the Cud.

The ſhort View I took of the Tongue hindred me from obſerving that ſingular Structure mention'd by Dr. *Moulins*. All I took notice of peculiar to it, was the firm Adheſion of the *Thyroides* to the *Os Hyoides*, which made me ſeparate and preſerve both; whereof ſee the Figure. As to what Dr. *Moulins* ſays, it ſeems to me very improbable; and I am ſorry the Head ſhould have been ſo mangled at the cutting off, that I was neither able to receive, nor to give you any ſatisfaction about it. However, I ſhall give you his Account, and acquaint you with my doubts.

Tab. 4. *Fig.* 11.

‘ The Paſſage, ſays he, to the Ventricle, was through a peculiar Hole, near the Root of the Tongue, and exactly in the middle of that part; which Hole was the beginning of the *Æſophagus*: There was no Communication between this and the Paſſage into the Lungs, contrary to what happens in other Animals; for the *Membrana Pituitaria anterior* reach'd to the very Root of the Tongue, below the *Æſophagus*; ſo that it could emit no Voice by the Mouth, but by the Trunk. This *Membrana* had many Paſſages for the *Saliva* uſually ſeparated there. There was between the end of the *Proboſcis* and the *Larynx*, a *Membrana Pituitaria poſterior*, which had many of the ſame ſort of *Ductus*.

An Obſervation of Dr. Moulin's, *concerning the Paſſage from the* Larynx *to the* Proboſcis.

This, I confeſs, ſeems to depend upon particular Obſervation, and yet I cannot ſee how it can well happen; for every one is ſenſible, that the *Larynx* occupies the fore part, and the *Æſo-*

phagus lies behind between the *Vertebræ* and *Larynx*. Now how the *Æſophagus* can lye thus behind, and yet have ſuch a Communication with the Mouth, as to hinder the *Larynx* from communicating with it, alſo is to me a very great doubt.

Remarks upon the foreſaid Obſervation.

He proceeds; ‘ The *Aſpera Arteria* was very large, and deſtitute of an *Epiglottis*, there being no danger of any thing falling into the Lungs from Eating and Drinking, ſeeing there was no Communication between the *Æſophagus* and it. Here the difficulty ſtill remains; for how can Aliments be ingeſted into the Mouth, and not paſs over by the *Larynx*, as is ſaid, before they enter the *Æſophagus*; that would emply, that the *Æſophagus* lies before, and the *Larynx* behind, which would quite invert all the Rules of the *Oeconomy* of Animals: Since then the *Æſopagus* muſt have in its deſcent paſs'd in betwixt the Head and Lungs, and then penetrated the *Diaphragma* or otherwiſe, and after it had deſcended a little, muſt have turn'd aſide and paſt behind the *Larynx*, as the *Arteriæ Iliacæ* do over the *Venæ Iliacæ*, which, tho' by cutting off the Head, I could not obſerve, yet is what ſeems improbable to me; becauſe then at the Deglutition, by the Preſſure of the *Æſophagus* on the one ſide, and *Vertebræ* of the Neck on the other, ever and anon would the Animal be oppreſt with a difficulty of breathing when it took Food.

He ſays further: ‘ To the outſide of theſe Catilages he found another grow, which was faſtned to them, but ſo as to be capable of moving up and down, by the help of ſome Muſcles which were implanted in it. 'Twas ſtrong on both ſides of the *Aſpera Arteria*; but oppoſite to the *Æſophagus*, or on the under-ſide it was very Limber. This wanted about 2 ½ Inches of coming round the aforeſaid Cartilages, (*viz.* the *Cartilagines Aritanoides*, which made a *Glottis*, in length about 3 ¼ Inches, and in breadth about 1 ½ Inch about the middle, whoſe Aperture was ſomewhat Oval) on the upper ſide, or that next to the *Æſophagus*. This ſeem'd to ſupply in ſome meaſure the want of an *Epiglottis*, in leſſening the *Glottis*, to prevent the creeping of Animals into it.

The Head.

Being come to the *Head*, I have very little remarkable to add in this Place: For the Brain itſelf very little differeth from that of an Human one, except in bigneſs, and ſomewhat in Figure; the other being ſomewhat Oval, and this more round. The *Dura Mater* was a ſtrong thick Membrane, every where diſengag'd from the *Pia Mater*; which together with all the Subſtance of the Brain, was much more tender, ſoft, and flaccid, than could have been expected. Whether this proceeded from keeping the Head 2 or 3 Days after the Animal dy'd, before it was diſſected, the Weather being then very hot, or from the languid Diſtemper whereof it dy'd, I know not. Its Subſtance, Ventricles, and other Parts, were the ſame as in other Animals. The *Cerebrum* had three large Productions at the *Baſis*, one anterior, from whence the Nerve *Olfactorij* proceed, and two lateral on each ſide of the *Cella Turcica*, reaching from the *Proceſſus Petroſus* behind to the above named Production before: For the Blood Veſſels and Nerves, which enter in and proceed from the Brain, we ſhall diſcourſe of them more particularly, when we come to the Holes of the Scull. I muſt not forget to tell you, that at the opening of the longitudinal *Sinus*, there were alſo *Polypus's*, which proceeded from the Orifices whereby the Blood emptieth itſelf in the *Sinus*.

Thus far the Anatomical Account of the ſofter Parts of this Animal; which I acknowledge to be deficient in many things, and thoſe conſiderable. I rather choſe to give you a lame Account of what conſiſted with my own Knowledge, than intrude upon you meer Conjectures for poſitive Truths, in order to render it more compleat.

The Oſteological Account of the Elephant.

I come now to the Fifth Thing I propos'd, wherein I hope to be more happy, as having more time to conſider the Bones than formerly I had to Survey the ſofter Parts; and doubt not to render this Deſcription ſatisfactory to ſuch as ſhall be willing to know more particularly the Structure and the Parts of the Bones of an *Elephant*. The Animal is big, the Bones large, and there be ſeveral things to be conſider'd in them, which do not readily happen in the *Oſteology* of other Animals; therefore I hope you will execuſe me, if I prove more tedious than might be wiſh'd. My chief deſign is to ſatisfy your Honourable Society, your ſelf, and *Tentzelius*; and if I do that, I have my aim.

I ſhall begin at the Head, as is uſual in *Oſteology*; where I ſhall firſt take Notice of its External Shape in general; next give an Account of the Bones whereof 'tis compos'd; and laſtly, give you a particular Deſcription, firſt of its External, then of its Internal Parts; ſhewing their particular Dimenſions and Weight, and aſcribing their Uſes to each of them as they occur, and as we can probably conjecture.

The

A brief Deſcription of the Scull.

The Head (A.) being compos'd of the Bones of the Upper and Lower Jaw, on its upper Part is almoſt round, having two Eminencies with a Depreſſion in the middle before; which Depreſſion, as it runs back, becomes a deep *Sinus*; and theſe Eminencies drawing nearer to one another, and as they aſcend behind, inclining obliquely forward, are not unfitly compar'd by Mr *Ray* to a Man's Buttocks: About its middle part it is almoſt Quadrangular, being flat before, till it comes to the Root of the Trunk (*a*.) where it is depreſt, for the more convenient Lodging of the *Proboſcis*, till it has paſt over the Mouth (*b*.) At each ſide 'tis much contracted for the moving of the Muſcles of the Lower Jaw (*c*.) at its back Part it becomes very narrow, with ſeveral Eminencies, *Sinus's* and Holes; of all which in order. At its lower and fore part, the Bone of the Palate is narrow, where the *Proboſcis* hangs over: On each ſide of which are the *Alveoli* for the Tusks, and behind, the Lower makes up all the reſt of the Head, as to its External view.

Tab. 2.

Deſcription of the fore-part of the Scull. *Tab.* 3. *Fig.* 1.

We ſhall begin the particular Deſcription of the External Parts of the Head at its fore-part; the Diameter of whoſe upper part is 3 Foot, the two Eminencies are almoſt round (*d. d.*) and the *Sinus* in the middle is 10 Inches from the Right to the Left, and 2 Inches deep (*e.*) from thence deſcending 5 Inches, the Bone is flat before, and begins to form an Angle on each ſide for the Cavity, which contains the Muſcles of the Lower Jaw and *Proboſcis*, between which Angles 'tis 11 Inches (*f. f.*) thence deſcending gradually the Angles tend outward, till they come to the upper Production for the Orbit of the Eye (*g. g.*) where they are 17 Inches; betwixt which is ſituated the Hole for the Root of the Trunk (*a.*) This Hole runs acroſs the Head, being from the Right to the Left 12 Inches, and from below to above on each ſide 7 Inches; for in the middle it has a Protuberance where the *Cartilaginous Septum* aroſe, which deſcends 2 Inches, and terminates in an obtuſe Point. Within this Hole are to be ſeen ſeveral of the *Laminæ*, whereof the *Cellules* which run betwixt the two Tables of the Scull are compos'd (*h. h.*) of which hereafter, with the *Vomer* in the middle (*i.*) whence the *Septum* of the Trunk ariſes. 'Tis pretty thick here, and is compos'd of two *Laminæ*, with a ſpongy Bone in the middle. At is upper and fore part it communicates with the *Os criboſum*; and you may ſee the ſeveral Perforations, through which a great many Branches of the *Nervus Olfactorius* paſs, and cover the Surface of the *Cartilaginous Septum*,

tum. At its lower and back-part, where it becomes gradually thinner, it divides the *Choana* into two; whereof hereafter. At the lower part of this Hole the Bone becomes Concave (*k.*) ſo that meaſuring from the middle of the Orbit of the Eye on both ſides, which are 3 ½ Inches diſtant, the Depreſſion becomes 2 Inches deep. At the middle of the lower part of this Hole begins a Suture, which runs down to the extremity of the Bone (*m. m.*) Theſe two Bones are articulated *per Symphyſin.* Dr. *Moulins* calls theſe *Oſſa Maxillæ Superioris*; but I rather incline to call them *Oſſa Palati.* They are 5 Inches broad at the upper part, where they are articulated with the *Oſſa Maxillæ Superioris*, by Dr. *Moulins Oſſa Malæ*, by the ſame kind of Suture (*n. n.*) From the upper part to the lower extremity of this *Os Palati* (*b.*) it is 15 Inches. After they have quitted the *Os Maxillæ Superioris* on each ſide, they run down with an obtuſe Angle; being Protuberant on their outer ſide, they incline gradually toward the Suture in the middle (*m. m.*) forming a Cavity 2 ½ Inches deep at the lower extremity, which is not ſo deep as at the middle. 'Tis deſign'd for the *Proboſcis* to reſt upon, and the Eminencies on each ſide are for granting ſpace for the *Alveoli*; whence the Tusks proceed (*o. o*) which are improperly call'd Teeth, (and therefore this Bone which contains them ſhould not be call'd *Os Maxillæ*) ſince they only ſerve for a Defence to this Animal, and ſhould rather be call'd its Horns. They are of different bigneſs in different Animals, and the Male ſeems to have them bigger than the Female; *v. g.* The *Elephant* which was burnt at *Dublin*, had them much bigger than this which died here; which conſiſts with the Knowledge of ſeveral in this Place, who remember to have ſeen both: And the Figure which Dr. *Moulins* gives of them, even tho' broke, ſeems to repreſent them much larger than thoſe in the Subject we have; which are very ſmall, not exceeding the bigneſs of an ordinary Cane, or not above one Inch Diameter, and ſtreight, ſo far as they remain unbroke: So that I am not in a Capacity to affirm or deny the Aſſertion of *Ariſtotle*, who ſays, *Mares grandiores reſimatoſque habent, Fæminæ minores, & contra quàm Mares, vergunt enim deorſum, pronique deviant.* Perhaps it might have been ſo with theſe; and that the Keepers (that the difference of the Sex might not be known, by their bending downward or upward) might have deſignedly broke them. Indeed there is great difference between the weight and length of theſe, had they been entire, and thoſe wonderful big ones whereof Authors give us an Account. *Tentzelius* tells us, that the length of thoſe deſcrib'd by him is 8 Foot; and he, with ſeveral others, tells us, that there are of them which weigh 100 Pound and upwards, ſome 140, others 150, and thoſe he talks of were above 200 Pound; inſomuch, that *Tavernier* tells us, that in the *Indies* they make Poſts of Doors and huge Pales of them: And 'tis memorable, which he ſays alſo, that the *Elephants* of the Iſle of *Ceyland* have no Tusks, but the firſt which the Female produces: And this we have confirm'd by Mr *Knox* in his Relation of this Iſland, that few of the *Elephants* there have Tusks, and thoſe only Males. There is a great debate among Authors, whether theſe ſhall be call'd Horns or Teeth. Thoſe who would have them be Horns, ſay; 1ſt. Becauſe they riſe from the Scull. 2. Becauſe they can be poliſh'd, and brought into any form, which 'tis difficult to do with Teeth. 3. Becauſe they fall off and grow up again, which the Teeth of no Animal do, except of Man. Such as would have them to be Teeth, tell us, that 'tis peculiar to ſuch Animals as have the Hoof divided into two, to have Horns; and that Horns are always cavous or ſpongy within; whereas theſe are altogether ſolid. For the firſt Reaſon, that they riſe from the Scull, tho' it be granted, yet it is after a different manner from Horns; for they always either adhere to the Scull by a certain Articulation, if not cavous, as in Harts, or have a Protuberance ariſing from it, and filling up their Capacity, if cavous, commonly call'd the Flint. For the ſecond, tho' it be granted they can be poliſh'd, *&c.* yet they are not capable of ſuch Alterations, as Horns are by Boiling, or burning in the Fire, ſuch as being made flexible. Indeed they ſeem more to agree by their Structure with Teeth; for they proceed from the Scull, and are planted in it *per Gomphoſin*; having in theſe we are ſpeaking of a large Cavity, about two Inches long, large according to the Diameter of the Tusks, at firſt, but as they deſcend tapering gradually, till they terminate in a Point analogous to the Cavities in the Roots of the Teeth, and filled up with the ſame kind of Subſtance, whereby they are kept firm in their Places. And as to their Structure, I doubt not but they have been compos'd of a mucilaginous Subſtance at firſt, as Teeth are; and that afterwards they augment by the appoſition of ſeveral *Laminæ*, or *Strata*, according as the Animal encreaſes in Years. Hence 'tis, that I ſuppoſe *Tentzelius* his Friend came to be convinc'd, that thoſe Bones he treats of, were of an *Elephant* 200 Years Old, by ſuch Marks as theſe *Laminæ*, which might have been taken from the Teeth.

Deſcription of the Tusks.

Teeth. Theſe *Laminæ* are very obvious in the Subject we have, and the ſmallneſs of the Tusks ſeems to be another Argument of her being Young, according to their term of Life. Whether they be call'd Teeth or Horns it matters not much; for if from their Subſtance we take their Deſignation, they may be call'd Teeth; and if from their uſe in puſhing, we may call them Horns; and to avoid any debate, let them be call'd Tusks or Defences. They run in this Subject about 6 Inches high in the *Os Palati*, and adhere by a ſtrong Ligament, as is already ſaid.

The ſide of the Head. *Tab.* 3. *Fig.* 2.

Sinus for the Eye.

We proceed to conſider the ſide of the Head. We told, that deſcending 5 Inches from the middle of the Depreſſion in the fore part of the Head, which is 7 Inches from the Top of any of theſe Eminences, it begins to form an Angle (*a.*) and the ſide of the Head becomes conſiderably depreſs'd, where the Muſcle of the Lower Jaw and *Proboſcis* is lodg'd. This Depreſſion from its beginning (*a.*) to the *Os Zygomaticum* (*h.*) (where it is 8 ½ Inches deep) is 14 ½ Inches diſtant; and from the fore-part (*g.* Fig. 1.) to the *Orificium Meatus Auditorij* (*k.* Fig. 2.) is 13 Inches; alſo from the upper Protuberance of the Orbit of the Eye (*f.*) to the Articulation of the *Os Zygomaticum* with the *Os Temporale* (*i.*) is 9 ½ Inches. At the fore-part of this Depreſſion is ſituated the *Sinus* for lodging the Eye; for 'tis improperly call'd Orbit, ſince only the half of the part where the Eye is lodged is boney: It has 3 remarkable Protuberances; one at the upper and fore-part (*f.*) whence a ſtrong Cartilage ariſes, and is inſerted in another 7 Inches diſtant (meaſuring obliquely) form'd by the Articulation of the *Os Zygomaticum* with the *Os Maxillæ* (*g.*) and a third in the middle (*e.*) at 3 ½ Inches diſtant from each of the former. This Protuberance ſerves for the Inſertion of the *Trochlea* of the *Muſculus obliquus major*. The bottom of the Orbit has another *Sinus* (*s.*) which conveys the *Nervus Opticus* to the bottom of the Eye, the upper part whereof is compos'd of a *Lamina* of the *Os frontis*, which lies over the *Os Maxillæ*: From beneath this *Lamina* not only proceeds the *Nervus Opticus*, *Motorius* and *Patheticus*, but alſo a conſiderable Branch of an Artery, Vein, and 5th Pair of Nerves, which running forward, paſs through a large Hole in the *Os Maxillæ* (*m.*) and are diſpers'd in the *Proboſcis*; whereof hereafter. This *Sinus* (*s.*) whoſe lower ſide is form'd by a *Spine* running along the *Os Maxillæ*, is 9 Inches long, 1 ½ Inch broad at the middle, and one Inch deep; but as it comes forward, 'tis enlarg'd as the Globe of the Eye encreaſes.

The Os Maxillæ Superioris.
Fig. 1.

The *Os Maxillæ* is a very irregular Bone. At the fore-part of the Scull it begins with a ſharp Point (*p.p.*) having that part of the *Os frontis* which forms part of the Orbit (*d.* Fig. 2.) on the one ſide, and that part of the *Os Palati* (*m.*) which forms the Hole for the Root of the Trunk on the other; whence running 6 Inches, and inclining inward by a crooked Suture, it terminates in a Protuberance; beneath which is a ſmall *Sinus* aſcending obliquely to the Hole for the Root of the Trunk (*n.*) fram'd by the Blood Veſſels (whereof above) as they go to the nouriſhment of the Trunk; from thence it runs obliquely backward, and is articulated with the *Os Palati* by a broad ſquamous Suture. From the middle Protuberance of the *Sinus* for the Eye (*d.*) it runs ſtreight backward, being articulated with that part of the *Os frontis* which forms the aforeſaid lower Edge of the *Sinus* for the *Nervus Opticus* (*s.*) for the ſpace of 18 Inches, where it begins to be overlaid with a *Lamina* of the Bone, which forms the upper and back-part; whence it deſcends 9 Inches, till it comes to the Root of the Teeth (*n.*) where we ſhall leave it, and return to the fore-nam'd Protuberance; from whence having made up a part of the *Sinus* for the Globe of the Eye, as is ſaid, it runs backward 6 Inches, and is articulated (by a flat Suture (*g.*) which firſt deſcends ½ Inch, then runs obliquely backward 2 ½ Inches) with the *Os Zygomaticum*. At its beginning its 2 ½ Inches broad; plain on its inner, and convex on its outer Surface; bended, as it deſcends, like a Horn, and terminating in a Point. From the lower part of this Suture it becomes much thicker; and having fram'd a *Sinus* about 4 Inches long, it runs toward the fore-part of the Scull. From this *Sinus*, as it has returned 3 Inches, is form'd the ſide of an Oval Hole, which running from before to behind is about 3 ½ Inches long, and from the one ſide to the other two Inches. At that ſide which is fram'd by the *Os Maxillæ*, and toward the *Proceſſus Zygomaticus*, 'tis two Inches thick; and at its other ſide, it runs ſtreight backward from the *Os Maxillæ*, in a direct Line, with the great Cavity, which contains the Muſcles that move the Lower Jaw and *Proboſcis*. This Hole is analogous to that in a Human Sceleton in the *Os Maxilla*, beneath the Orbit of the Eye; and is larger in Quadrupeds, being deſtinated for tranſmiſſion of a Vein, Artery, and the ſuperior Branch of the ſecond Diviſion of the 5th Pair of Nerves, which in thoſe go to the Upper Lip and Jaw; but in this Subject, as I have already ſhewn at large, 'tis probable they ſerve for the Nouriſhment and other Functions of the *Proboſcis.* Tho' it be very obſervable, and of ſignal Uſe, yet 'tis ſo ſituated, that I was not capable to give ſuch a View, as might afford a true Idea of it, in any of the Figures of the Head: However, I have mark'd it *(r.r.* Fig. 1.) and *(m.m.* Fig. 2.) (8.8. Fig. 3.) From this Hole the *Os Maxillæ* inclines 6 Inches, toward the Root of the Teeth *(n.)* where we leave it, and return to

The Os Zygomaticum. *Fig.* 1. *Fig.* 2. *Fig.* 1. *Fig.* 2.

The *Os Zygomaticum* (*s.*) (*h.*) (*i.*) which, as in all other Animals, ſerves for a Guard to the Muſcles which move the Lower Jaw. In Men, and ſeveral other Animals, 'tis form'd of a Production of the *Os Temporale*, articulated with another from the *Os Malæ*, by a particular Suture, call'd *Sutura tranſverſa*; but here 'tis the moſt diſtinguiſh'd Bone of all the Head; for being 12 Inches long and two Inches broad, 'tis articulated with the *Os Maxillæ* before, and running backward 6 Inches, it meets at its upper part with a Production of the *Os Calvariæ* (*f.*) as we may call it, which accompanies its lower part other 6 Inches, and then terminates in an obtuſe Angle. 'Tis looſely join'd with this Production, and 'tis probable, that 'tis capable of conſiderable Motion, upon the following Accounts. 1. The *Sinus* in the back-part of the Scull, as ſhall be ſhewn, for receiving the *Condyles* of the Lower Jaw, are larger than the *Condyles* themſelves, by which they have a pretty good ſpace to move from the Right to the Left; and the extremity of the *Os Zygomaticum* being their Guard on each ſide at the outer part, which way they move, theſe may be ſuppos'd to yield. 2. The Lower Jaw is of ſuch weight, that its Muſcles muſt require a great ſpace to act in, and that may be conciliated by the Motion and Yeilding of this Bone. 3. The Grinders of the Lower Jaw are much longer than thoſe of the Upper, and therefore they require a greater ſpace to move in, for the better Performance of Maſtication, (becauſe the Upper Jaw in this, as in moſt other Animals, is immovable) to which the Motion of this Bone muſt very much aſſiſt. Add to theſe, the manner of its Articulation; for it reſts upon the Production of the *Os Maxillæ* before; and behind it moves, as it were, to and fro, upon the Production of the *Os Calvariæ*, which reſts upon it.

The back-part of the Head.

The back-part of the Scull is next to be conſider'd: At its upper part the two Eminences formerly mention'd now appear more conſiderable, becauſe of the intervening *Sinus*, which from two Inches deep, and 10 Inches from the Right to the Left, becomes

Fig. 3. comes 4 Inches deep; for the Eminences (*a. a.*) approach (as they run backward) much nearer to one another, and the *Sinus* running obliquely downward becomes ſtill deeper, having a *Spina* Fig. 6. (*c.*) 6 Inches long and one Inch deep. This *Spina* ſerves for Inſertion of the Muſcles, which move the Head. The Bone on each ſide of it is very rugous; which ſeems to be an excellent Contrivance, becauſe there is ſuch a deal of Strength requir'd here in the Tendons, for ſupporting the weight of the Head of this great Animal, 'twas requiſite the Surface of the Bone whence they ariſe ſhould be very unequal, that their Fibres may be the more firmly impacted therein. Here 'tis alſo that the *Tax-Wax* formerly mention'd was inſerted. By means of this *Spina* in the middle, and the Eminences on both ſides of the *Sinus*, the Surface of the Bone is much more enlarg'd, and the Muſcles with their Tendons are more capable to move the Head, either directly or obliquely to either ſide, than if the Bone had been plain. After the *Spina* of the *Sinus* is ended, the Bone ſwells out toward the back-part 3 Inches, and then deſcends 1 ½ Inch till it comes to Fig. 3. the Hole for the Spinal Marrow (*d. d.*) and here the Bone from above the *Orificium Meatus Auditorij* (*f.*) on each ſide, becomes Protuberant 10 Inches (*e. e.*) till it comes to the *Proceſſus Condyloides* (*c. c.*) This Protuberance has the ſame Office as the *Apophyſis Maſtoides* in other Animals, *viz.* for Inſertion of the Muſcles which bend the Head inward. The *Proceſſus Condyloides* (*c c.*) are 7 ½ Inches diſtant incluſive; each of the *Condyles* being 2 ½ Inches broad from the Right to the Left, as they ariſe gradually from their outer ſide, and from below to above ariſing (as it were Semicircularly) 5 Inches long. The Hole for the Spinal Marrow (*d. d.*) at the upper part betwixt the *Condyles* is 3 Inches broad, 2 ½ Inches at the middle, and 2 Inches at the lower part, till at laſt it terminates in a Point. 'Tis 3 ¼ Inches long, and its Margin about the middle of the *Condyle* is 2 Inches thick. Below theſe *Condyles* the Bone becomes more flat; inſomuch, that tending inward there is a *Sinus* fram'd, above which the *Proceſſus Styloides* ariſes (*g.*) being there articulated *per Synchondroſin.* This *Proceſſus Styloides* is cartilaginous about one Inch (*h.*) at its Baſe; whence ariſing hard and ſolid 4 Inches (*k.*) flat on its inſide, and convex on its outſide, being one Inch broad, it is afterwards divided, ſending out another Bone 5 ½ Inches long (*i.*) which bending toward the Scull, but outward from that place whence it proceeded for the ſpace of two Inches, it becomes gradually ſmaller, till it terminates in a Point not unlike that part of a Pen wherewith we write. This Bone is ſo ſituated in the *Baſis* of the Scull, that 'twas impoſſible to give any Idea of it *in Situ*, and therefore I caus'd them to take the Figure of it apart. Betwixt the *Sinus* below the *Proceſſus Styloides* and the *Condyles*, at 1 ½ Inch diſtant, is ſituated the Hole for the jugular Vein (*m.m.*) through which alſo paſſes the *Par vagum* (See *n.* Fig. 14.) which being Oval, is 1 ¼ Inch long, and ½ Inch broad. On the outſide of the *Proceſſus Styloides*, is to be ſeen the Hole for the hard Portion of the *Nervus Auditorius* (*l.*) This is ſo near to the Root of the *Sinus*, that it could not be well ſhewn in the Figure. Betwixt the Origin of the *Proceſſus Styloides* (*g.g.*) and the Hole for the jugular Vein (*m.m.*) is lodg'd the boney part of the *Aqueduct* (*n.n.*) which deſcends 5 Inches; 'tis ½ Inch broad, and ſo flat that it could ſcarce be repreſented in the Figure. From thence is a *Crena*, whoſe Orifice is repreſented by (*o.o.*) where its fleſhy part was contain'd, which communicated with the Palate; it deſcends 3 Inches obliquely inward. From the foreſaid Hole for the jugular Vein (*m.m.*) is ſituated the Hole for the Carotid Artery, which is ſo large as to admit the Point of ones Little Finger (*p.p.*) Deſcending in a ſtreight Line from the *Proceſſus Styloides* (*g.*) 3 ½ Inches, you come to the Hole where the *Arteria duræ Matris* enters the Scull, and by which the 3*d* Branch of the 5th Pair of Nerves paſſes out: Here alſo the Vein, which returns by the great Hole in the *Os Maxillare* from the *Proboſcis*, (after it has paſt ſome ſpace beneath the *Lamina*, which makes up the upper edge of the *Sinus* for the Orbit of the Eye,) paſſes out, and runs back to be joined with the jugular Vein. Theſe Holes are ſituated on each ſide, betwixt the *Aqueduct* and the *Sinus* for reception of the Lower Jaw (*y.*) and are both receiv'd within a like *Sinus*, ſo that they could not be repreſented by an Orifice. The Bone for Reception of the *Proceſſus Styloides*, as I have ſaid, is depreſt; and from thence for the ſpace of two Inches, till you come to the Hole for the Carotid Artery (*p.p.*) it is rais'd for the *Aqueduct* (*n.n.*) From thence, betwixt the two Holes, 'tis gradually Protuberant to the *Condyle*: From below this Hole (*p.p.*) ſtreight downward, during the Progreſs of the two *Aqueducts* (*n.n.*) which are 3 Inches diſtant, 'tis depreſt, till you come to the *Choana*, or Paſſage betwixt the Palate (*t.*) and the Root *Fig.* 1. of the Trunk (*i.*) Between the two Holes for the *Arteria duræ matris* 'tis 6 Inches (*q.q.*) The length of the *Sinus*, called in Human

man Subjects the *Glenoid* Cavity, meaſuring from that part of it which is toward the Hole for the *Arteria duræ matris* (*q.q.*) till you come to the extremity of the *Os Zygomaticum*, is 5 ½ Inches long. This *Sinus* is ſcarce at all depreſt; 'tis rather Protuberant, with a Semicircular Surface from above to below: 'Tis well enough guarded on both ſides; ſo that notwithſtanding this Protuberant Reception for the *Condyles*, yet their Diſlocation is prevented by the extremity of the *Os Zygomaticum* on the outſide (*x.*) and on the inſide, firſt by an hollowneſs, and then by a Riſing in the Bone. And this Contrivance ſeems to facilitate the Motion of the Jaw very much; for had this *Sinus* been proportionably ſo deep (however Superficial it may be) as in Human Subjects, its Motion had not been ſo very free, as we ſee it is: For by this half round Surface, the *Condyles* have the more ſpace to move backward, and the Lower Jaw to be depreſt, that it may move forward, and preſs the Aliment againſt the Upper Teeth with the greater Force; the Muſcles alſo prevent its falling too much back, and the *Os Zygomaticum* its inclining too much to either ſide, as is obſerv'd. Above the big Proceſs of the *Os Maxillæ*, which is articulated with the *Os Zygomaticum* is the Fig. 2. *Orificium meatus Auditorij* (*k.*) which being Oval, is one Inch long, and ½ Inch broad. Betwixt this external Orifice and the *Proceſſus Petroſus*, the *Meatus* is 8 Inches long; whereof hereafter. By means of this great *Sinus* on each ſide, the *Baſis* of the Scull is ſo contracted, that from the Hole (*q.*) down toward the Root of the Teeth (3.4.) which is 9 Inches long, the breadth is but 7 ½ Inches. From the extremity of the boney part of the *Aqueduct* downward, the Baſe of the Scull is compos'd of two cavous Bones, about 2 ½ Inches thick, and a large *Sinus* in the middle 3 ½ Inches Diameter (*S.*) at the end of the *Sinus* for the fleſhy part of the *Aqueduct*, and at the Root of the Teeth 4 ½ Inches. This *Sinus*, after 'tis become 2 Inches deep, terminates in the *Choana*. This Paſſage is 8 Inches long, and 2 ½ Inches broad, with the *Vomer* in the middle (*u.*) extending from hence to the Root of the Trunk 8 Inches. The back part of this *Vomer* is ſharp and thin, but its fore-part thicker, conſiſting of two *Laminæ*. Dr. *Moulins* is of Opinion upon Obſervation of the Tongue, whereof before, that the *Elephant* only Breaths by this Paſſage, and not by the Mouth. I do not find that this Paſſage is proportionally more Patulent in this Animal than in any other, only it ſeems to be more direct; for as in other Animals this Hole communicates with the Root of the Noſe, and the Bone gives the Air at its *exit* another direction; ſo here the fore and back-part of the *Choana* are directly oppoſite, but then the Trunk itſelf gives the Air a quite other direction than in the Bones of other Animals. Indeed there is one Argument which ſeems to ſtrengthen Dr. *Moulin*'s Opinion, *viz.* That by the Trunk the *Elephant* ſucks up any Liquor it has occaſion for, which it afterwards empties into the Mouth; and ſo by drawing in of the Air, it is able to keep in its Extremity any thing it takes hold of. However, the Objections advanc'd againſt this Opinion formerly, ſeem to be of greater Moment, than theſe Arguments here propos'd, are for it. Theſe two cavous Bones on each ſide the *Choana*, are fill'd up from the two firm, ſolid, white, weighty Teeth (3. 4.) the back one whereof does not grind, but ſerves, as it were a wedge, to keep that before firm in its Place (5.) This Tooth runs obliquely backward 3 Inches from the fore Tooth. That part of it which is without the Jaw Bone is half round, being 6 Inches in Surface from its Root on the one ſide to that on the other, very polite, as *Tentzelius* is pleaſed to term it, and ſmooth like Glaſs. How far this Tooth or the other may go up, I cannot poſitively determine, neither give any Account of the Figure within the Bone, unleſs I had broke the Scull. However, I ſhall inſiſt more upon the Teeth, when I come to the lower Jaw; all I ſhall add at preſent is, that their *Alveoli*, eſpecially that which contains the hind Tooth, are as thin as can be imagin'd. The length of each of the Teeth is 7 Inches. Theſe Teeth are not alike on both ſides; for that on the Right is but one Inch without the *Alveolus*, throughout its whole extent, on the outer ſide; and on its inner, 'tis one Inch Protuberant at its fore, and two Inches at its back-part; whereas that on the Left ſide is only one Inch Protuberant before on the outſide, and 3 Inches behind, where it forms a kind of Angle, as it is join'd with the hind Tooth; and on the outſide 'tis ½ Inch Protuberant before, and 2 Inches behind. The Tooth on the Right Side (2.) grinds with that of the lower Jaw, throughout its whole extent; whereas that of the Left, after it has run back 6 Inches, runs up with an half round Surface two Inches (5.) before 'tis join'd with the hind Tooth. It would ſeem, that this difference betwixt the Shape, Situation, and Dimenſions of the Right Tooth from the Left is not ſingular here, for Dr. *Moulins* doth likewiſe take notice of it, in that which dy'd at *Dublin*; for he ſays, 'The length of the Teeth of the Right Up-'per Jaw is 4 Inches, but that of the oppoſite was but 3: The

Teeth, or Grinders of the Upper Jaw.

‘ two outward or fore Teeth of the Upper Jaw, were ſomewhat ‘ longer than thoſe of the Under. He takes no notice whether the hind Teeth of the Upper Jaw grind or not; but here, as I have ſaid, not only both the hind Teeth are free from grinding, but alſo part of the fore Teeth of the Left ſide. Theſe Teeth, as Dr. *Moulins* well obſerves, are all *Molares*, being 2 Inches broad; that part of them wherewith they Grind is 6 ½ Inches on the Right Side, and 5 ½ on the Left. Their Surface, tho' flat, yet is very unequal; for they have alternatively plac'd (running from the Right to the Left) an hollowneſs, and then an Eminence, and this Eminence is ſurrounded by a rough Protuberant Border. There are nine of each of the Hollowneſſes, and as many Eminences, undulated, as they uſe to paint Sea Waves; which ſeems to quadrate with what Mr *Ray* ſays, *viz.* That theſe Teeth have 8 or 9 ‘ parallel undulate Lines in their Surface. The Situation of theſe Teeth, for what I know, is peculiar to this Animal; for inſtead of running from above to below, as in other Quadrupeds, they run from before to behind, as in human Subjects, being plac'd at . . . Inches diſtance at the beginning, or fore-part, and . . . Inches at their hind part. From the fore-part of theſe Teeth the *Os Palati* runs down . . . Inches, having that diviſion in the middle (whereof formerly) much enlarg'd (10.) This Bone, as to its thickneſs in this Subject, is correſpondent to the Tusks, which are implanted in each ſide of it, as is ſaid. It ſeems to be thus plac'd upon two Accounts; 1. That it may anſwer to the diſtance, or cover that part of the Lower Jaw which runs betwixt the fore-part of the Grinders above (*c.c.*) and the Proceſs at its lower and middle part (*e.*) 2. That it may afford ſpace, as we formerly obſerv'd, for the Trunk to reſt upon, leſt it ſhould be obnoxious to the Mouth.

Fig. 7.

The Lower Jaw.

Fig. 7. 8.

Fig. 3.

The Lower Jaw is the only External Part of the Head, which comes now to be conſider'd, conſiſting of one big Bone, and compos'd of its fore and hind part, and five Proceſſes, *viz.* two *Condyles* (*a.a.*) two *Proceſſus Coronæ* (*b.b.*) and one *Proceſſus Menti* (*e.*) 'tis articulated with the Upper Jaw, as in all other Animals, by a double *Arthrodia*. The two *Condyles* (*a.a.*) are 12 Inches diſtant incluſive; their Surfaces Convex, both from the Right to the Left, which is 3 ½ Inches, and from before to behind, which is 2 Inches. They are received into the *Sinus* of the Upper Jaw (*x.*) which, as I have ſaid, is 5 ½ Inches: So that they have ſpace enough to move at Maſtication. The Neck below the *Condyle* is 3 Inches from before to behind at its ſmalleſt part, whence deſcending 3 Inches, it becomes 6 Inches broad (*b.*) and two Inches *Fig.* 8. thick at its back-part, where it forms an obtuſe Angle; whence running forward at its outer ſide 2 Inches, it begins to form a *Sinus* for Inſertion of the Muſcles which move the Jaw. This *Sinus* running forward 4 Inches more, terminates in a ſharp edge of the Bone, which deſcends to make up the *Proceſſus Coronæ* (*b.b.*) This *Sinus* is 8 Inches from above to below: At the upper part of the *Proceſſus Coronæ*, 'tis 8 Inches broad from before, where 'tis ſharp, to behind, where tis thick and obtuſe, and at its middle 9 ½ Inches (*b. b.*) the *Proceſſus Coronæ* from a- *Fig.* 9. bove to below 6 Inches, with, as it were, a Semicircular edge, but ſomewhat more Protuberant, where 'tis not ſo ſharp as the Margin above. How we come to the inner ſide of the ſame part of the Bone, where we find that deſcending 7 Inches from the *Condyle*, till we come a little below the foreſaid obtuſe Angle, there are the beginnings of a large Hole (*b.b.*) 3 ½ Inches long, *Fig.* 8. *viz.* from the firſt framing of its *Sinus* to its lower part, and 1 ½ Inch broad. This Hole is for receiving the Veſſels fit for forming and nouriſhing the Teeth; whereof hereafter: Here the Jaw begins to be about 4 Inches thick behind, being convex in its back-part; whence running 4 Inches forward, it inclines about 2 ½ Inches inward, where it forms a large *Sinus* for inſertion of the *Muſculus Maſſeter*, and whereof no *Idea* could be given in the Figure; for the outſide always obſtructed the view of the inſide. This *Sinus* deſcends obliquely from the Neck of the *Condyle*, till it comes to the Root of the Teeth (*c.*) 9 Inches, which ſpace does not appear ſo large in the Figure, becauſe of the Poſition of the Jaw; and from the fore part of the *Cotonæ* backward, till the Jaw become thick, 5 ⅓ Inches: From the back-part of the Jaw at the foreſaid obtuſe Angle, till you come to the Point of the *Proceſſus menti* (*b.*) in a ſtreight Line, is 27 Inches. The Arch of the back Surface from the ſame Angle, till you come equal with the beginning of the Teeth, or lower part of the *Coronæ* (*c.*) is 14 ½ Inches; from whence meaſuring outward from the Root of the Teeth, it is 3 Inches to the foreſaid lower part of the *Coronæ*; from thence to the middle of the back part 5 Inches; and from the Root of the Teeth at the External to the ſame place at the Internal Part, is 16 Inches; and here the Jaw is about 4 Inches thick behind. At the joining of the two Teeth ſtreight downward, 'tis 6 ½ Inches; and here it inclines gradually outward for above 3 Inches; whereas its inner Surface is almoſt plain, or at leaſt for the ſpace of 4 Inches, and then inclines 3

gradually outward below, forming an Arch in its Progreſs.
Streight downward from the loweſt part of the *Corona*, the Jaw
is at the thickeſt (*c.*) and here it begins to run obliquely for-
ward, till meeting with the ſame part of the Bone from the o-
Proceſſus Menti. ther ſide, it terminates in the *Proceſſus Menti* (*b.* Fig. 9. *e.* Fig. 7.)
which about 2 Inches runs obliquely outward, and ſeems very
convenient for defending the Mouth from the Inconveniencies of
the Trunk; which by its weight would preſs too much upon it,
were it not defended both by that part of the *Os Palati*, which
runs down from the Teeth in the Upper Jaw, upon which it leans;
and by this *Symphyſis* or *Proceſſus Menti*, *b. e.* which keeps it ſtill
inclining downward, and ſuffers it not to bend inward: Add alſo,
that this Proceſs may aſſiſt the *Proboſcis* ſomewhat in its Elevation,
when the Animal bending the Head a little forward, may make
the Point puſh or bear up the *Proboſcis* from above it. As the low-
er part of the Jaw in its Progreſs forward runs obliquely down-
ward, ſo its upper part of the Root of the Teeth runs ſtreight
Fig. 7. forward, or rather inclines a little upward (*c. e*) ſo that whereas
'tis only 6 ⅓ Inches from above to below at the joining of the
Teeth, now 'tis 7 ½ Inches ſtreight downward, (and here its Sur-
face is more plain, for before 'twas convex, and as it were half
round) but along the edge of the *Sinus* for lodging the Tongue
Fig. 7. 8. (*d. e.*) to the outmoſt point of the *Proceſſus Menti*, 'tis 9 Inches.
Now we conſider the inner part from the Place where we left it,
Sinus *for lodging the Tongue.* *Fig.* 8. and find it ſtill more plain; where meaſuring from below the
foreſaid joining of the two Teeth ſtreight forward, 'tis 4 Inches
on each ſide, till both meet in a Semicircle (*f.*) about 3 Inches
Diameter at the lower part, and ſomewhat nearer at the Root
of the Teeth. After it has run 2 Inches upward, it runs ſtreight
forward with a convex Surface 4 Inches thick; thence it aſcends
Fig. 9. 4 Inches more to the Root of the Teeth (*d.*) This *Sinus* is for lift-
ing the Tongue, which is very narrow and pointed. Thus ha-
ving given a particular Account of the External Figure and Shape
of the Lower Jaw, we ſhall conſider it in general. The *Con-
dyles* are 12 Inches incluſive diſtant; whence the Bone running
downward, and ſomewhat backward 3 Inches, forms an obtuſe
Angle, which is 17 Inches excluſive diſtant from its oppoſite;
and here the Bone begins to ſwell to a conſiderable thickneſs by
degrees: From thence deſcending gradually 8 Inches, 'tis 18
Inches diſtant; thence inclining obliquely forward 8 Inches more,
'tis 14 ½ Inches diſtant; inclining ſtill more forward to the
Baſe where the two Bones meet, the Bone ſtill becoming thinner,

'tis

Fig. 9.

T. b. 2.

Maxillaris interior.

The Rudiments of the Teeth.

Fig. 8.

'tis 9 Inches; from which on each ſide, till you come to the *Proceſſus Menti*, 'tis 7 Inches: Thus far as to its back-part. Now to its fore-part: Firſt, there is the *Condyle* (*a. a.*) then there is a ſharp Spine which runs obliquely to the *Coronæ* (*b. b.*) whence to the Root of the Teeth 'tis thicker and of a Semicircular form: Oppoſite to this, the Bone begins to ſwell at its outer ſide, and becomes plain at its inner; that is to ſay, as to that which regards the Mouth, and that which doth not. Its Surface on both ſides is very polite and ſmooth, having a great many Holes for immiſſion and egreſs of the Blood Veſſels, which nouriſh the Bone; and at its fore-part, it has two large Holes for the *Maxillaris inferior* (Z. A.) or Branch of the 5th Pair of Nerves, which are diſpers'd at the Roots of the Teeth. Next we come to the inner Subſtance of the Bones, ſo far as can be gueſs'd, becauſe the preſerving of the Sceleton entire, has kept me from penetrating ſo far into the Knowledge of it, as my Inclination might have led me. Every one is ſenſible, who knows any thing in *Oſteology*, as well Human as Brutal, that immediately below the *Coronæ*, or thereby, there is a pretty large Hole in proportion to the Animal, for the emiſſion of a Branch of the External Carotid Artery, Jugular Vein, and 5th Pair of Nerves, call'd *Maxillaris inferior*, which are diſpers'd in the Roots of the Teeth for their Nouriſhment, and for conciliating to them that lively Idea of Pain, which thoſe affected with the Tooth-ach are very ſenſible of; and that in this Hole in Sheep, Calves, and other Quadrupeds, eſpecially ſuch as are young, as alſo in Children before the 7th Year, and even afterwards for ſome time, in the cavous part of the Bone, where the Teeth do not penetrate the Jaw, there are Rudiments of Teeth to be ſeen cavous in that extremity, which is toward the Baſe, (in which the Ligaments that keep the Root fix'd are firmly impacted) and ſolid at the other extremity; ſo in this Animal from the fore-mention'd big Hole, I obſerv'd ſeveral of theſe Rudiments of Teeth lying *Stratum ſuper ſtratum*, or rather placed perpendicularly acroſs the Bone of each others ſide, from the Hole (*b. b.*) till the Teeth began to appear. Thoſe that were plac'd neareſt the Hole were ſmaller, not above one Inch in breadth, and ½ Inch in length, *i. e.* from above to below, cavous, as is obſerv'd, at the lower or back-part, (for reception of the Ligament, which is guarded by two thin hard *Laminæ*) and ſolid at the other. Thoſe neareſt the Hole were two or three times interſected by Membranes, whereby they could be disjoin'd. But after I had taken out ſeveral, I found no more ſuch a Separation, but that from the Right to the Left, they were wholly cavous: Each of them was inveſted by a membranous Tunicle, as it were a *Perioſteum*, and had ſomething like a Cartilaginous Subſtance betwixt the two. Their Surface is very unequal at the Orifice, where they receive the Ligaments and Veſſels *(c.)* and as if they had been folded into ſeveral *Plicæ*, and afterward taken aſunder, from which there run ſeveral Ridges and *Sulci (b.)* from one extremity to the other; where the Ligaments ceaſe, they become extreamly ſolid and ponderous, and at their upper Extremities half round, and ſometimes form'd into Digitations *(a.)* Tab. 3. Fig. 19. When they approach to that part of the Bone at which the Teeth appear, they begin to quit the *Perioſteum*, by which they were diſtinguiſh'd, and unite cloſe together, ſo as to form one Bone. 'Tis obſervable, that at their upper Extremity there is a *Lamina*, which being Convex toward the Jaw, and Concave toward theſe Rudiments of Teeth, do as it were knit their ſolid Extremities together, from which 'tis alſo ſeparated by an intermediate Membrane at the beginning; but afterward that ceaſing, this *Lamina* conjoins them at the Extremities, as they are at the Sides, before they appear without the Jaw. And thus I conceive theſe Teeth to be form'd, and 'tis by theſe I am perſwaded the Jaw becomes ſo ponderous and thick; and that which ſtrengthens this Opinion is, that the hind Teeth of both Jaws (for I doubt not but theſe *Rudimenta Dentium* are in the Upper Jaw alſo) before they come to grind, have their Upper Parts Semicircular; and that both before and after the Grinders are form'd, the Lineaments of theſe *Rudimenta* appear plainly like ſo many Ridges (*d. e.*) having intervening Furrows, where they formerly had Fig. 9. been diſtinguiſh'd by Membranes: And I ſuppoſe tho' at the upper Extremity they are united into one compact Bone, yet at their lower Extremity they have ſtill the ſame Hollowneſſes for Reception of the Ligaments and Veſſels as formerly; which Opinion is confirm'd by *Tentzelius*'s Account. The Lower Jaw has 4 Teeth, 2 on each ſide *(d. e.)* as well as the Upper, all Grinders, but no Inciſors, or fore Teeth. The hind Teeth are 8 Inches diſtant, and the Fore not 4, betwixt which is plac'd the *Sinus* for the Tongue *(d. e)* and 'tis obſervable, that from thence to the bottom the *Sinus* is ſo contracted, as only to be one Inch Fig. 7. 8. broad *(f.)* The hind Tooth on the Right Side is 4 Inches, on the Left 5. The one half of their Surface, where they begin to appear, is Semicircular, with the fore mention'd Ridges and *Sulci* running tranſverſely, 4 on the Right Side, and 5 on the Left. The other half has 5 of thoſe Eminences, where it Grinds, (whereof formerly, when ſpeaking of the Upper Jaw,) and 4 on the Left. Each of the fore Teeth is 6 Inches long, and has 6 or 7 of the fore-mention'd Eminences, and as many Depreſſions. The hind Teeth of Dr. *Moulin*'s Elephant ſeem to have been of an equal length on both ſides, and much longer than the fore Teeth. 'Tis obſervable, that the Ridges at the ſides are correſpondent to the Eminences where they Grind, and the *Sulci* to the Depreſſions. The Teeth of the Lower Jaw exceed thoſe of the Upper about 2 Inches in length; by which it appears, that the motion of the Lower Jaw muſt be very great in Maſtication, and that the *Elephant* for the moſt part moveth the Jaw from behind to before; and ſcarcely from one ſide to the other, as in Animals that ruminate, or chew the Cud. Theſe Teeth are the moſt firm, ſolid, and weighty Bones of any Aninal yet known, and are as good Ivory as the Tusks themſelves. Before we quit the Lower Jaw, I hope it will not be impertinent to enquire, whether or no theſe *Rudimenta Dentium* may be ſuppos'd in proceſs of Time to deſcend and expell thoſe Teeth already form'd, and ſucceed in their place; and if not, what may be their Uſe. For the firſt queſtion, 'tis true, Children have two ranges of Teeth tho' not equally ſolid, the ſecond whereof expels the firſt at or about 7 Years of Age, and ſucceeds them, the firſt being only ſo many Sheaths or Covers, whereby the ſecond, being yet but a ſoft Mucilaginous Subſtance, are defended from External Injuries, till in proceſs of time they have attain'd to a convenient hardneſs; and that there is a great difference in the Teeth of ſome Quadrupeds, ſuch as young Horſes, whoſe Fole or Colt Teeth, as they are call'd, have ſome Marks, which are obliterated after a certain period of Years (well enough known to Jockies;) ſo that it would appear, if theſe Teeth are not expell'd, yet their Surface by degrees is abraded, and inſtead of that their Roots are augmented, and the Teeth receive ſuch an alteration, as their Age is no more known by theſe Marks. I have already obſerv'd, that there are ſeveral Ridges and Furrows in the Teeth of this Animal, which ſeem to be an Evidence, that theſe *Rudimenta* have grown together and become one Tooth; but whether the *Rudimenta*, which have not as yet appeared without the Jaw, do ever expel theſe which have appeared, and ſucceed them, is the queſtion; no Experiment yet being made concerning the Production of thoſe in this Animal. The period of the Time that *Elephants* live, and the Age of this we treat of being unknown, we can give no poſitive determination in this Mat-

The Teeth, or Grinders of the Lower Jaw.

ter: Yet I am apt to believe, theſe Teeth as well as the *Rudimenta*, have been *à prima formatione*, and that becauſe, 1. The Jaw Bone ſo firmly adheres to the Teeth on both ſides, ſo ſoon as they appear, and the place of their Roots is ſo well known (by the Protuberance on the outſide of the Jaw) to be enlarg'd within the *Alveoli*, that I do not ſee how they can be expell'd by a ſucceeding Set. 2. When one Set of Teeth expels the other, the ſecond is uſually below the firſt, and not plac'd in the ſame Rank, as theſe are; which obliges me to enquire, what may be the uſe of theſe *Rudimenta*: Which I ſuppoſe to be, 1. To fill up the Cavity of the Lower Jaw. 2. By their Weight to add Strength in Maſtication. 3. That there may be ſo many different Bones to aſſiſt the Teeth in their motion; and 4thly, to ſerve inſtead of a Wedge for keeping the Teeth firm in their Place. For the firſt, 'twas convenient the Lower Jaw ſhould bear an equal proportion in its bigneſs to the Upper, and have ſufficient ſpace for Inſertion of the Muſcles fit for its Motion; and if a proportionable bigneſs, than either the Bone muſt be altogether ſolid, or cavous and ſtuff'd with ſome other ponderous Subſtance; for, if ſpongy or cellulous, then would it have been too light, which would have been very inconvenient. As to the ſecond, the Weight is of conſiderable Moment, for the more exact Attrition of the Aliment, which is here requiſite, becauſe the Tongue of this Animal is both ſmall and polite on its Surface, without thoſe ſharp cartilaginous *Papillæ* thoſe Animals are endued with, whoſe Teeth are not ſufficient to grind their Food. As to the third, I conceive that theſe *Rudimenta*, with their intermediate Membranes, may be the more helpful to the Teeth in their Motion, if they have any, or Preſſure, than if the ſurrounding Jaw had been one whole continued ſolid Bone. For the fourth, a hard and ſoft Subſtance alternatively plac'd, is certainly more convenient for keeping any thing firm than either of the two alone; for had they been hard Subſtances that lay upon one another, then neither would yield to Preſſure; and if ſoft, tho' they yielded, yet would they not ſo well retain the Preſſure they receive, and keep any thing firm thereby, as if they had ſome intermediate Subſtance: In a word, be the uſe of theſe *Rudimenta* what it will, the Teeth and they together have rendered this ſo ponderous as to amount to 45 ℔ Weight. And thus have we ended the External Parts of the Head.

N. B. *The remaining Part of this Diſcourſe (with the Figures) will be inſerted in the following* Tranſaction.